The Electrical Industry's Weekly Magazine

May 29, 1961

Electrical World

A McGraw-Hill Publication

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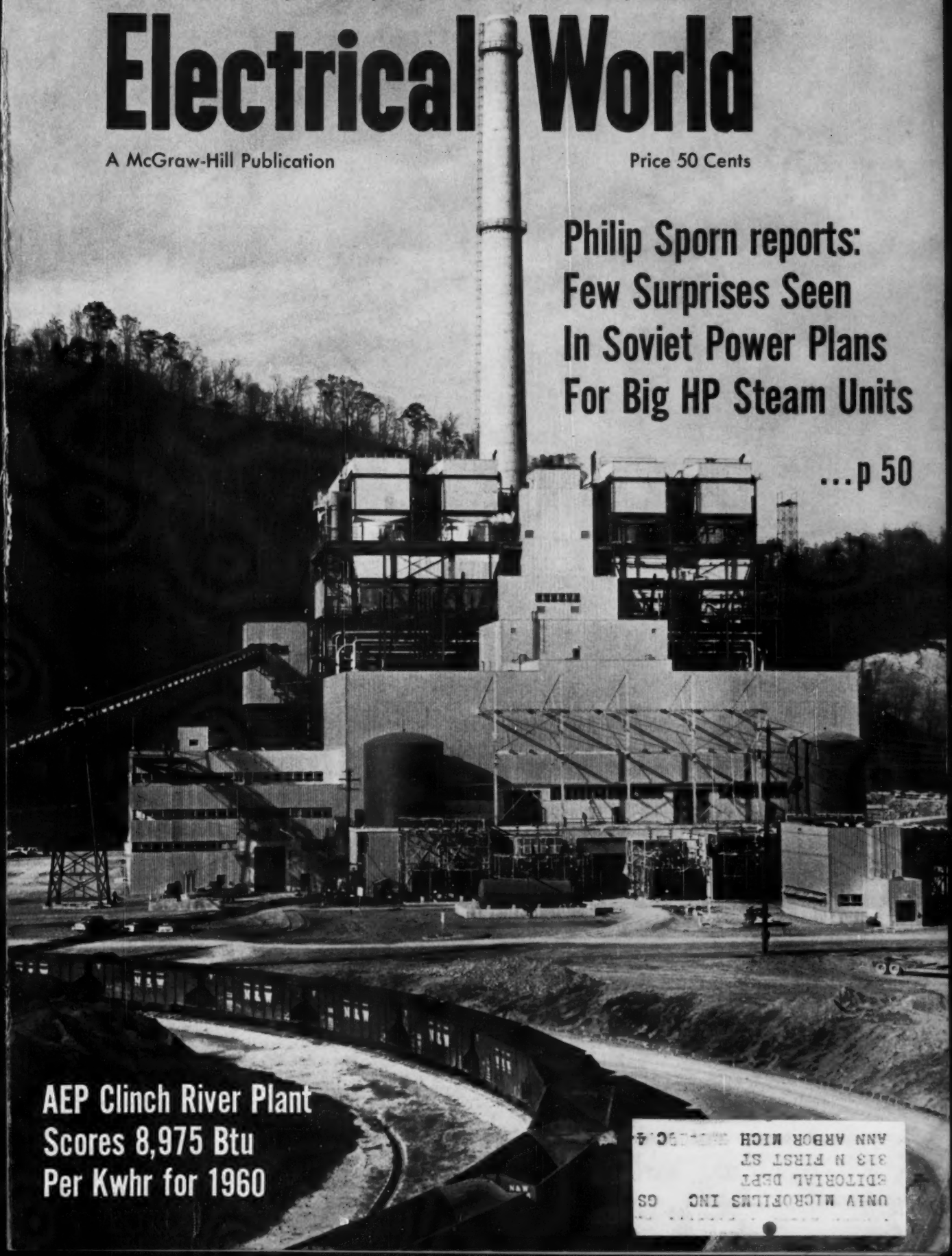

Philip Sporn reports: Few Surprises Seen In Soviet Power Plans For Big HP Steam Units

...p 50

AEP Clinch River Plant Scores 8,975 Btu Per Kwhr for 1960

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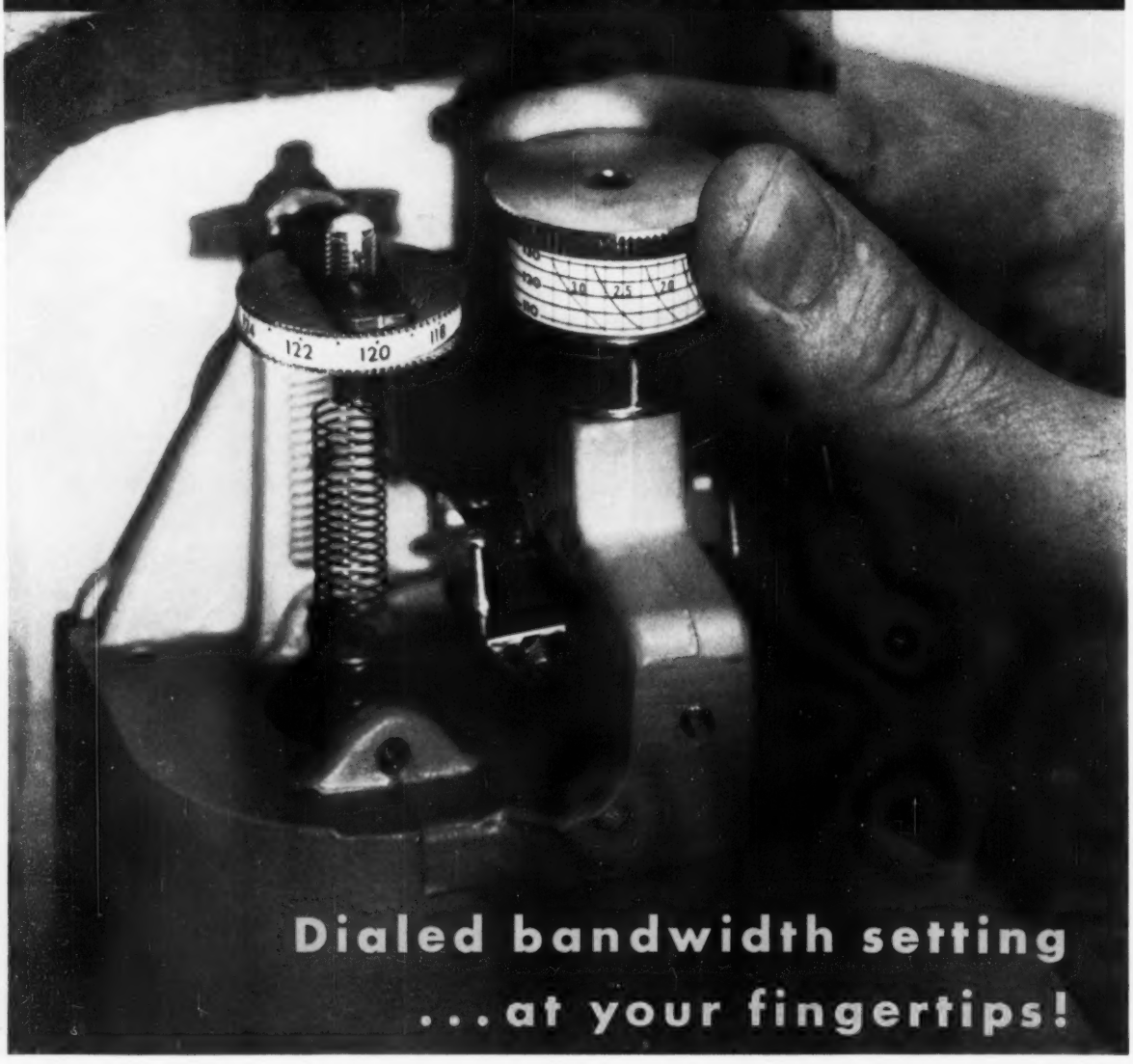
ANOTHER STEP AHEAD IN VOLTAGE REGULATION



New, exclusive G-E Micro-Band* relay permits fast, accurate setting of both regulator voltage level and bandwidth

Now, with General Electric single- and three-phase step voltage regulators, you can dial optimum voltage level *and* bandwidth *in seconds . . . with micrometer accuracy!*

This important new advantage results from G.E.'s exclusive Micro-Band voltage-regulating relay—the first in the industry to offer you a dialed calibration of *both* these vital adjustments.

Micro-Band relay saves you time and money by eliminating the guesswork and painstaking procedures normally involved in making regulator adjustments. What's more, this *full* calibration permits precise coordination of voltage level and bandwidth setting with General Electric's highly flexible time-delay control. Thus, you take full advantage of the reduced bandwidths possible with General Electric regulators—bandwidths proven by recent computer studies to offer you increased system earnings at no sacrifice of regulator life.

Your General Electric regulator representative has complete information on the new Micro-Band relay and can show you how to achieve system savings through reduced regulator bandwidths. Call him today. Or write General Electric Company, Section 456-08, Schenectady 5, N. Y. *Voltage Regulator Products Section, Pittsfield, Mass.*

* Trade-mark of General Electric Co.

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Published for 87 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

Electrical World

May 29, 1961
Vol. 155, No. 22

Dateline . . .

Taking a New Look at Coal Mines

Hills of the Virginias—You hardly see a shovel in a coal mine any more.

In four days of touring coal mines in Virginia and West Virginia recently, representatives of the press saw only one shovel—and that was on a railroad car *outside* a mine.

The tour was sponsored by the National Coal Policy Conference, an organization of railroads, mine machinery manufacturers, and electric utilities as well as coal producers and the miners' union. Expressed purpose of the NCPC press tour was to show the latest in mining and railroading technology.

This they did.

Coal mining today is in its second level of mechanization. Picking, shoveling and drilling by hand were replaced in the early and late 40's by cutting, drilling, and loading machines—again the old familiar process of substituting electric energy for human energy.

Today, in some places, this first level of machines is being replaced by the continuous miner—a machine that grinds coal right out of the mountain and loads it into a car in one operation. Operated by one man, it can mine and load six tons of coal per min.

Today the pace of coal mine mechanization is such that 200,000 men do the work of 400,000 men in 1945. Production per man-day has climbed to about 13 tons, and is expected to increase still more in the future. For instance, a deep mine is now producing 35 tons per man-day but will go to 45 tons when in full production. And newer and more automatic machines are being designed.

The National Coal Policy Conference let something more important than technology out of the bag, however. A spirit of cooperation is apparent among coal producers, mine workers, coal transporters, and coal users. This spirit is evident not only among the managers of these enterprises but also among the workers. They are cooperating to produce and transport coal at lower and lower costs, with the hope they can increase the market for coal.

In the same vein, an observer hears remarks about

(*Continued on page 5*)

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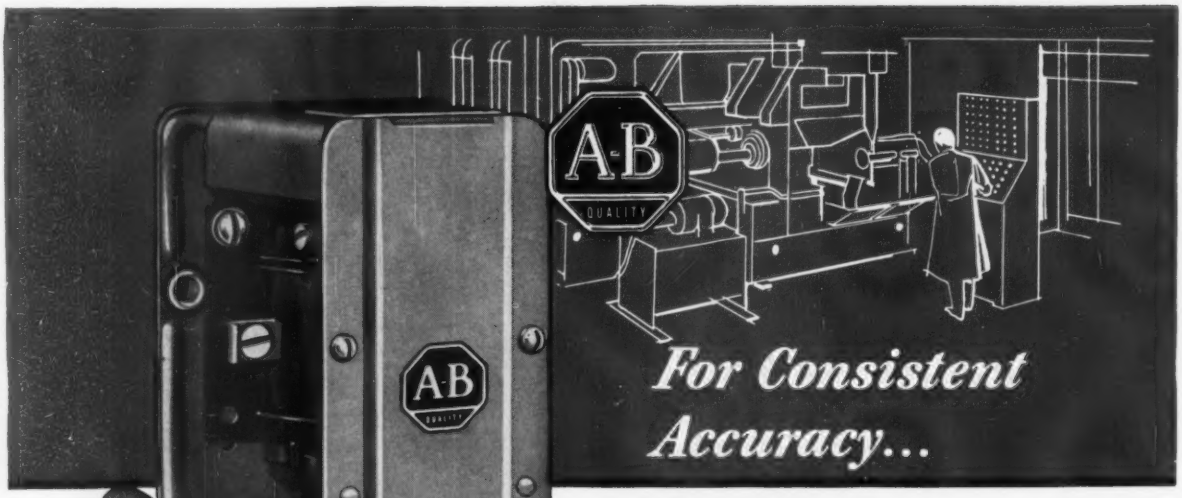
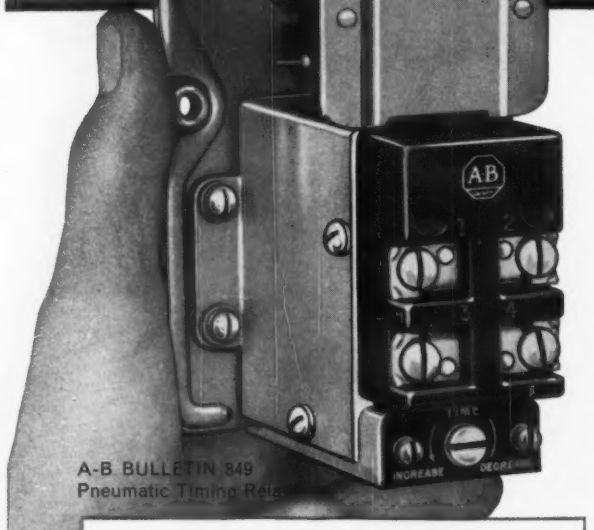


For Consistent Accuracy...

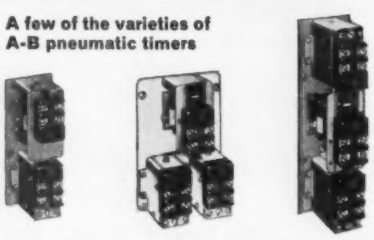


Specify ALLEN-BRADLEY TIME DELAY RELAYS

For maximum production, high-speed automatic processes demand that the required operations "start" and "stop" at the correct instant, time after time—*without variation*. For consistent accuracy and trouble free operation, no timing relay on the market can equal the performance of A-B Bulletin 849 pneumatic timers. The delay period can be varied from 1/20 of a second to 3 minutes, and the setting will hold with an accuracy of ± 10%. Conversion from ON-DELAY to OFF-DELAY (or vice versa) is simple—no adjustment is necessary. Like *all* A-B control, these quality timers have maintenance free, double break, silver contacts. The two sets of contacts—one N.O. and one N.C.—are electrically independent, for greater control flexibility. Also, auxiliary contacts can be easily added.

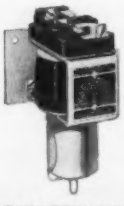
To make certain of a completely satisfactory electrical installation, specify Allen-Bradley "quality motor control"—in addition to the Bulletin 849 pneumatic timing relays. Write for details, today.

A few of the varieties of A-B pneumatic timers

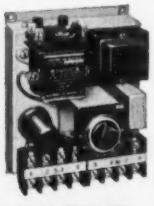


Single operation time delay relay | Dual operation time delay relay | Compound operation time delay relay

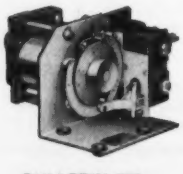
Allen-Bradley makes a broad line of timing relays to satisfy all automatic processes.



BULLETIN 848
Fluid Dashpot Timing Relay



BULLETIN 852
Electronic Timing Relay



BULLETIN 850
Motor Driven Process Timer

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Quality Motor Control

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Dateline . . .

(*Continued from page* 3)

the reliability of coal as a fuel. Reserves are beyond imagination. And ten years have gone by without a work "stoppage." It is easy to remember when this was a yearly affair. Coal producers and workers today realize that their big customers, the electric utilities, must have a reliable supply of fuel. They are striving to improve their reputation and produce an impression of a reliable supply so that utilities can depend on coal.

Some are even going further. They are encouraging electric utilities to take advantage of this more reliable supply and reduce their fuel storage piles—thereby reducing over-all fuel costs. Efforts are being made in other directions too. Long-term contracts for fuel supply with dedicated reserves are being pushed. Special railroad rates based on trainload deliveries are being tried.

These efforts are directed towards the goal of more level workloads, with the expectation of lower costs for the long run. Does this sound familiar?

Here is an industry that five years ago was faced with declining markets. Beset with economic pressures, the industry drew together; personal animosities were laid aside for the sake of mutual survival. Faced with the competition of oil and gas and the decline in markets, the industry formed a conference —the NCPC—which provided a vehicle for all concerned to meet as equals and as men faced with a common problem. Today they are meeting in an atmosphere of wider understanding of common problems and recognition of the specific interests of each. Results are already apparent in the increasing productivity of the men in the industry, in the spirit which prevails in the industry, in the drive for lower costs, and in the search for new markets.

Coal is working hard to fulfill electric utility needs. It is working hard to lower costs.

Letters

High Commendation for Rate Book

To the Editor:

Your "Electric Utility Rate Economics" book (by Russell Caywood) is the finest text of its kind that I have ever seen. A fellow worker and colleague of mine here at the Atlantic City Electric Co just loaned me this book and I am considering purchasing a copy for myself.

In this connection, I am wondering if there has been a more recent edition of this text. It appears that most data referred to in the book goes back to the year 1954.

Now for my second question: Is there a publication of such nature that touches on the theory and practice and application of gross receipts and franchise taxes? I realize a complete text would not be written on this phase of utility taxation, but somewhere in some of your valuable published material, perhaps you could refer me to a source.

I am not looking for any comparison source, but for a little descriptive material about such taxes in the electric utility field.

I will be grateful for any information you can furnish me. . . .

J. J. Tynan
208 Twenty-first St South
Brigantine, N. J.

▶Thank you for your kind remarks about the book on rates which *Electrical World* had the privilege to sponsor. The volume now is in its second printing but this is still the first edition and therefore has not been revised. On your second question, we don't know of any specific publication on the general subject of gross receipts and franchise taxes in the public utility field. However, we did prepare a story entitled "State Taxes Are Biting Deeper" which appeared in *Electrical World*, Feb. 3, 1958, p 107. This article covered all state taxes against utilities and said that about 20 states had a tax on sales of electric energy at that time. You might possibly obtain more information on this subject from Tax Foundation, Inc, 30 Rockefeller Plaza, N. Y.

This is your column in Electrical World. Address your comments, questions, or criticisms to the Letters Editor, Electrical World, 330 *West* 42*nd St. New York* 36, *N. Y.*

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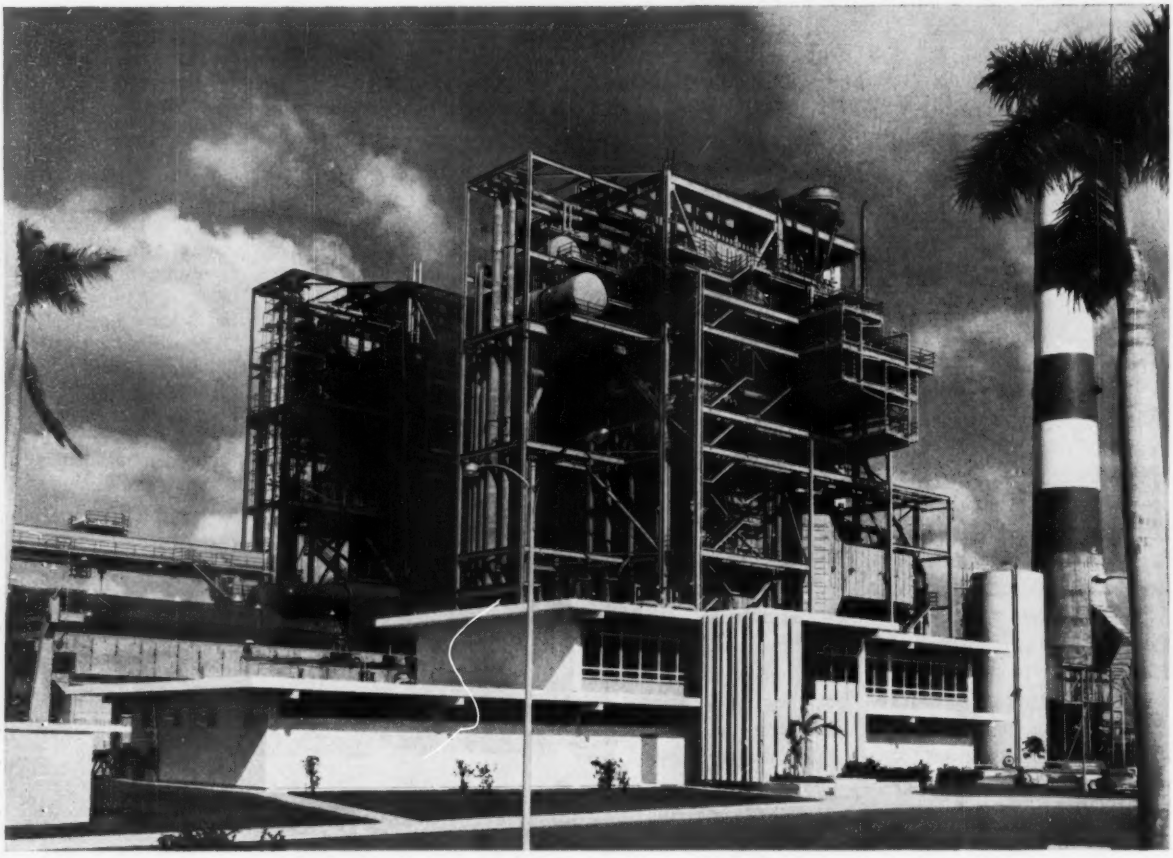
FLORIDA'S NEWEST AND LARGEST STEAM PLANT



Completion in April of a second 240,000-kw unit made Florida Power and Light Company's Port Everglades steam plant the newest and largest in its extensive system.

The first unit began producing power in May, 1960. Both units in the 480,000-kw plant—which is designed for ultimate expansion to more than 1,000,000-kw—were designed and built by Bechtel, on schedule and within budget.

Bechtel's first project for Florida Power and Light added two 165,000-kw generators to the Fort Lauderdale steam plant.

Successful performance led to repeat business for major engineering and construction in this progressive utility's expansion program.

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Use Graybar as your auxiliary warehouse for line construction materials and you make substantial savings of both time and money – in planning, ordering, checking. Save on inventory and transportation costs.

This is because Graybar stocks just about everything needed for line construction, "from the top of the pole – to the bottom of the hole" – and can deliver it all promptly to your central warehouse, substores or work centers.

Another important source of savings – the wide variety of construction tools available from Graybar that help speed the job.

Start with a local call . . . Have your local Graybar man stop in for a discussion.

Employee-owned Graybar has been on the line and part of the local scene for years. Whether you require 3 items or 3,000, Graybar is your centralized source for most electrical utility equipment and supplies.

When Graybar is your auxiliary warehouse —

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- Insure prompt delivery
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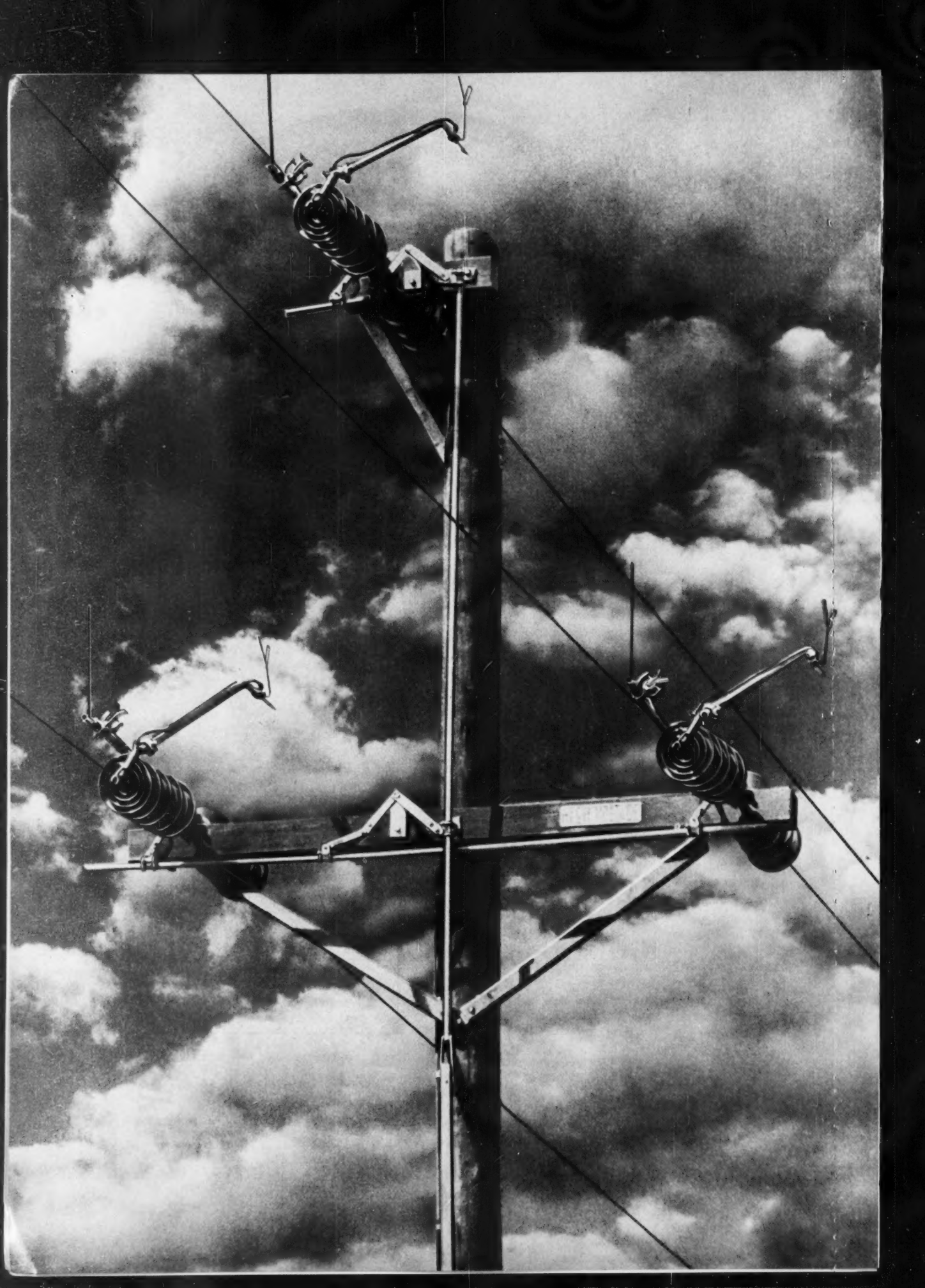

DEPENDABILITY is *not* suddenly

Reliable performance is seldom achievable overnight. It is the product of sound basic design, careful manufacture, and conservative rating. And, beyond this, the years of experience and continual improvement that winnow out hidden problems common to most new products.

Your air break switches are the most significant single elements in your distribution lines. KPF's half-century record of operating dependability, of mechanical surety, is your comforting assurance of performance and safety.

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Can you afford to specify other than KPF?

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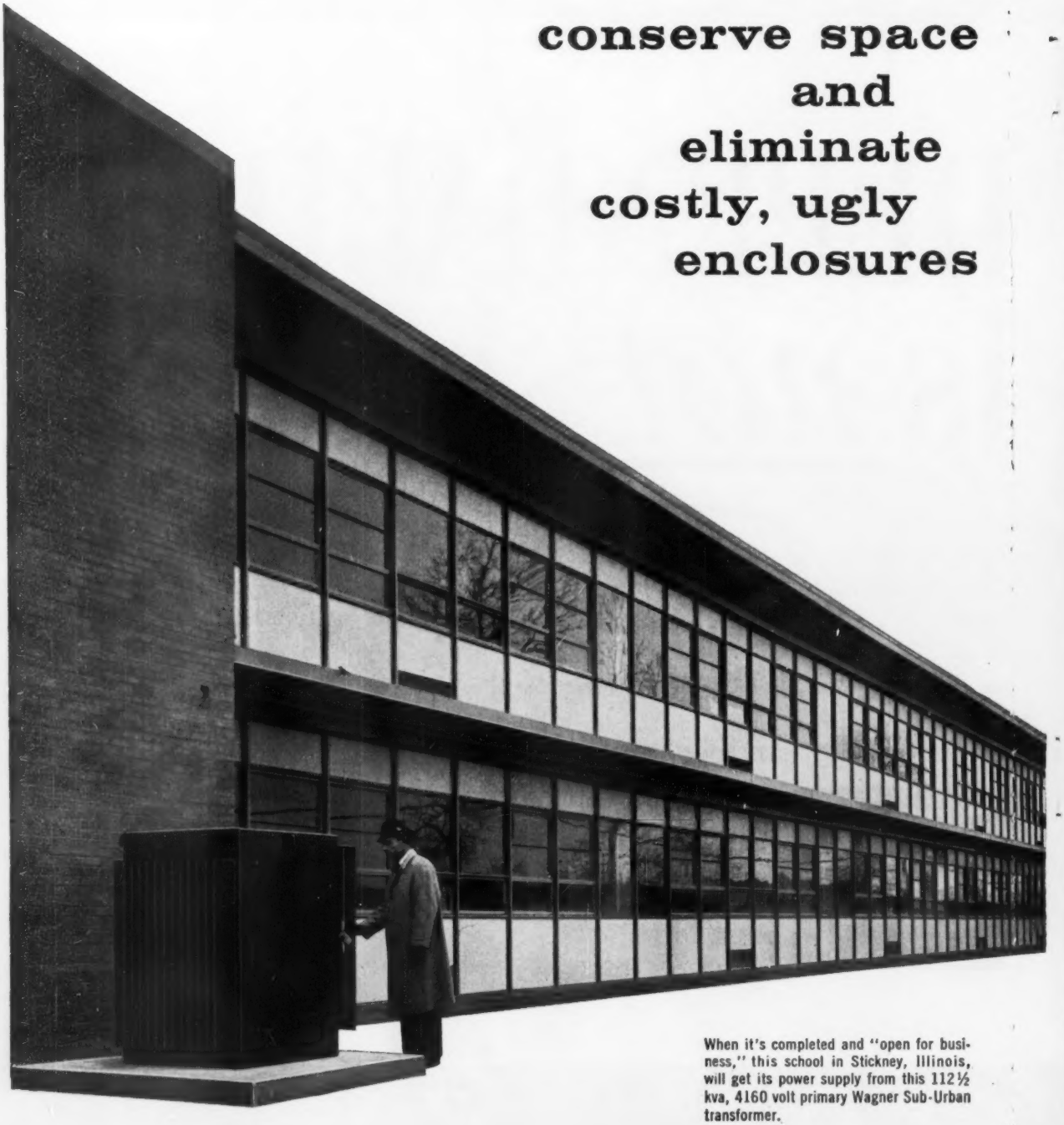
WAGNER® SUB URBAN PAD

conserve space and eliminate costly, ugly enclosures



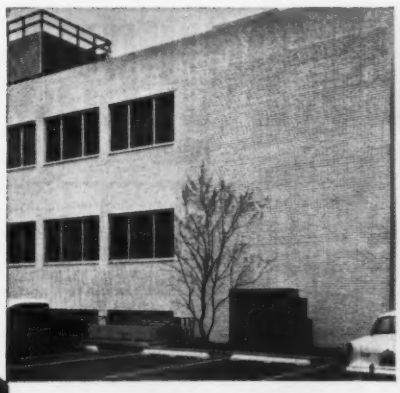
When it's completed and "open for business," this school in Stickney, Illinois, will get its power supply from this 112½ kva, 4160 volt primary Wagner Sub-Urban transformer.

MOUNTED TRANSFORMERS

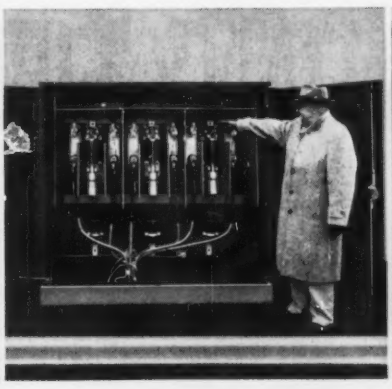
Thinking of going undergound? If you're planning a new distribution substation... reworking or modernizing an existing system... write Wagner® Sub-Urban pad mounted transformers into your specifications. It's the economical way... the complete unit is mounted above ground, and no costly vaults or enclosures are necessary. Save space, too. They're so well ventilated they can be installed close to the building and still be loaded to capacity. Some low shrubbery will hide them neatly... the good looks of your buildings and landscaping are retained.

Incoming lines and outgoing feeders are completely out of sight, buried in the ground. And far fewer faults occur in an underground system over a period of time than would generally occur in a comparable overhead system. People who use the buildings served by pad mounted transformers are protected from exposed hot lines, and your crews are protected by a door over the primary compartment which lets them work on the secondary without danger from high voltage. Enclosures lock tightly to protect the equipment itself.

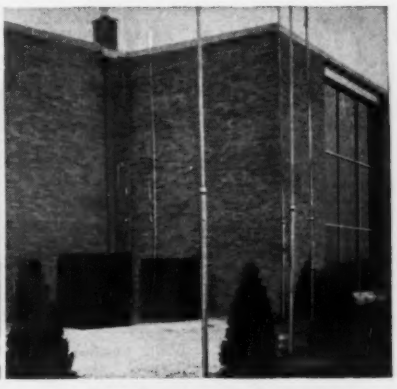
Wagner Sub-Urban pad mounted transformers are available in singlephase, 25-167 kva; threephase 75-750 kva. They require only routine maintenance, and when load growth makes it necessary, larger transformers can be quickly and easily installed to replace original units.



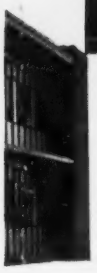
This Wagner Sub-Urban transformer is installed at the Park Ridge, Illinois, executive offices of the Square D Company. It is a 500 kva, three-phase delta-connected, 4160 volt primary transformer.



H. D. Ely, senior staff engineer of a large midwestern utility points to the special HV switching arrangement which permits sectionalizing the primary of a three-phase loop system at the Square D Company.



These transformers serve the Dorcherster Club in Dolton, Illinois. The larger transformer supplies power to refrigerate an indoor skating rink. The smaller unit powers the club's general services and all-electric kitchen.



Check with your Wagner Sales Engineer. He's got complete data on Sub-Urban pad mounted transformers... all the facts and figures that prove how easy it is to plan less costly, space-saving transformer installations.

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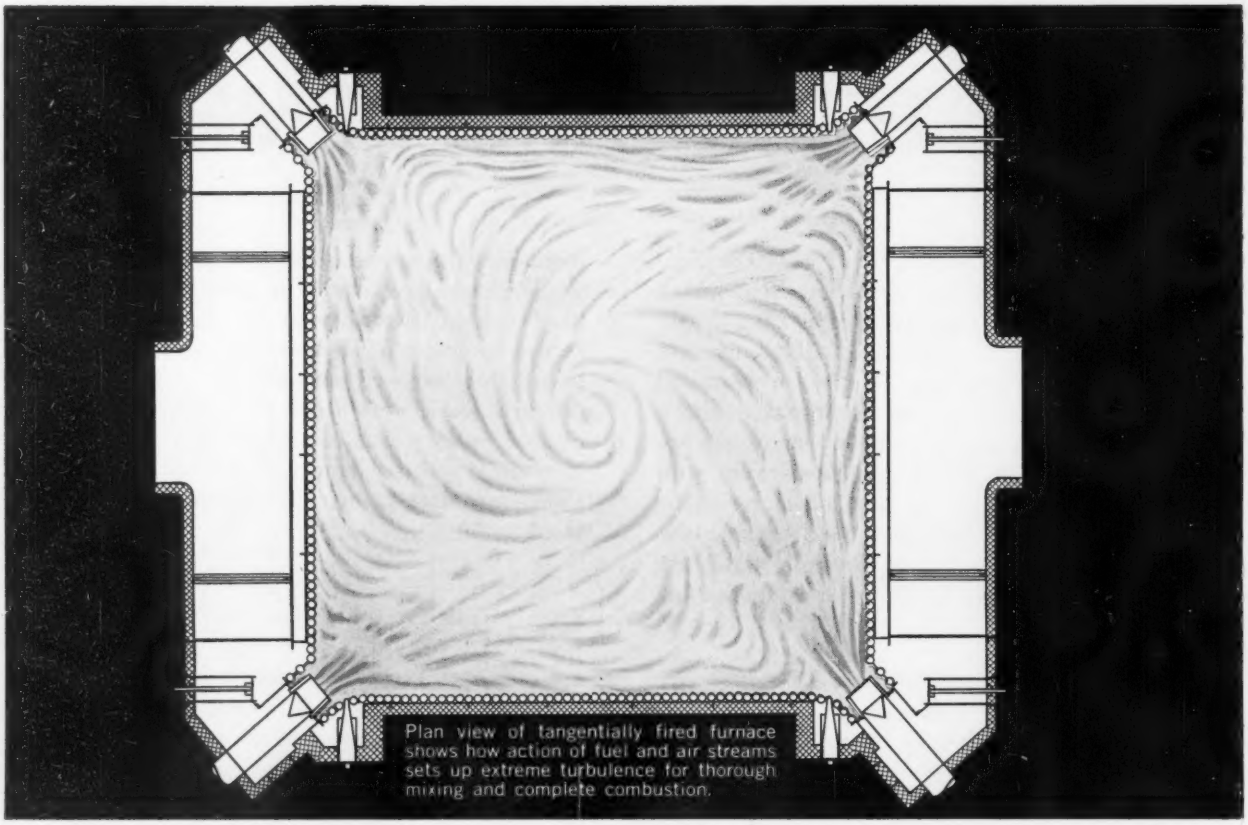
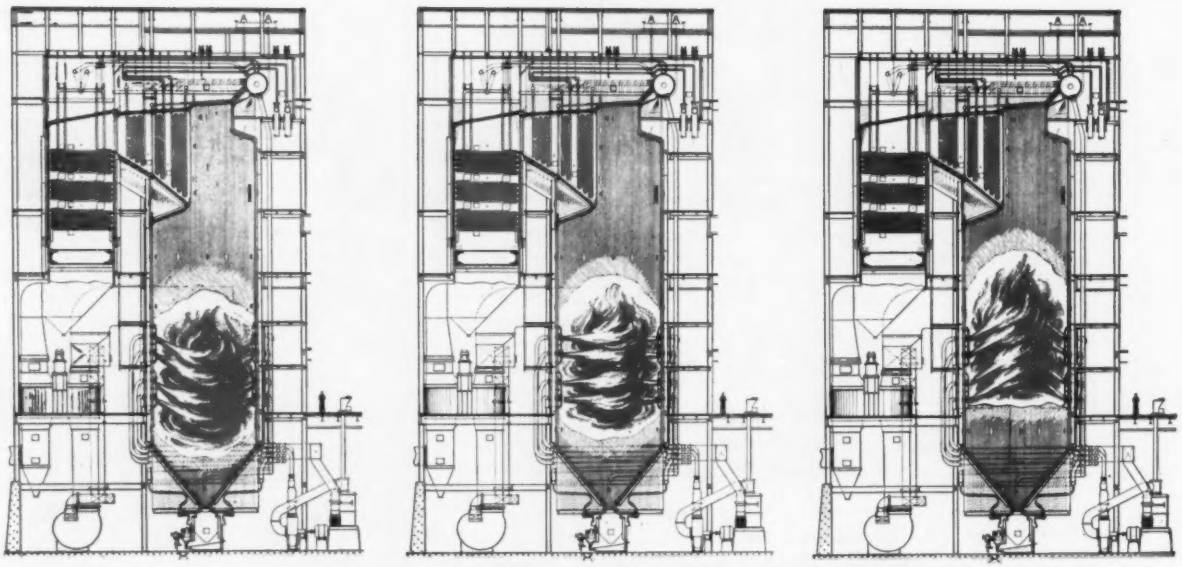


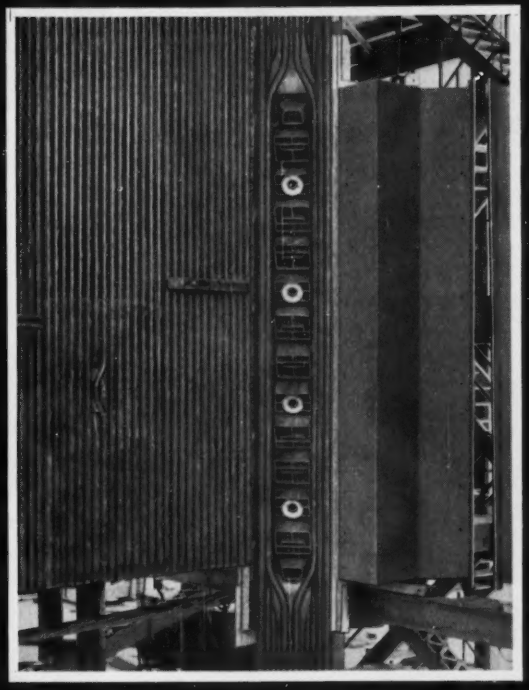
Plan view of tangentially fired furnace shows how action of fuel and air streams sets up extreme turbulence for thorough mixing and complete combustion.

C-E TANGENTIALLY FIRED BOILERS



HOW C-E TILTING TANGENTIAL BURNERS CONTROL SUPERHEAT.

First diagram shows burners tilted downward to reduce furnace outlet temperature. Middle diagram shows normal operating position. Third diagram shows upward tilt to send higher temperature gases to superheater.



Erection view showing shop assembled burner panel being placed in position for welding to wall panels. All four corners of the furnace are similarly equipped.

give more complete combustion... most sensitive steam temperature control

Tangential firing—pioneered by Combustion in 1927—is today the most widely accepted method of firing pulverized coal, gas or oil, separately or together, in large utility boilers. Air and fuel are fed to the furnace in a number of relatively small streams which are directed from each of the four corners of the furnace.

This assures intimate mixing and sets up a strong turbulent motion within the furnace . . . to produce the most complete combustion with minimum carbon loss. The combustion gases fill the furnace for more rapid heat transfer to the waterwalls.

The tilting nozzles of C-E Tangential Burners automatically tilt up or down as steam temperature varies. If steam temperature goes too high, the nozzles tilt downward . . . more furnace wall surface becomes effective . . . gas temperature to superheat surface is lowered . . . steam temperature goes down. Or, if steam temperature drops, the nozzles tilt upward . . . hotter gases go to the superheater . . . steam temperature goes up.

Catalog PC-8 gives full information on tangentially fired C-E boilers, including units with capacities as low as 70,000 lb of steam per hour. Write for your copy today.

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Our Research and Development Department grows just about every kind of fungus you can find, and we do it for good reason . . . to make sure you get a better cable. Many of our cables are used in fungi-infested locations. We fight the fungi by including fungitoxic agents in the saturant for insulation tapes and sometimes in the insulating rubber compounds themselves. We can inhibit fungus growth or, where necessary, use even stronger toxicides to kill it completely. So we grow fungi to make sure that USS Tiger Brand cables will give you years of trouble-free service.

This is just one of the many ways our Research and Development Department makes sure the quality of USS Tiger Brand Wire and Cable is the best you can get. Our research laboratory tests all materials used in Tiger Brand products. We experiment with new materials and methods to make USS Tiger Brand Electrical Wire and Cable even better.

That's why, whatever the job, it pays to specify USS Tiger Brand Electrical Wire and Cable. You can't buy better cable. American Steel and Wire, Dept. 1163, 614 Superior Avenue, N.W., Cleveland 13, Ohio. USS and Tiger Brand are registered trademarks

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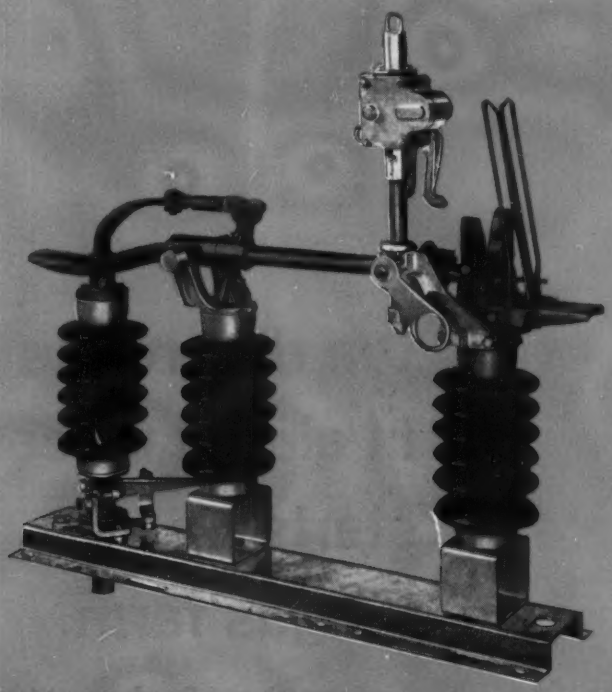


ARI-60 ..a distribution load break switch with power class features

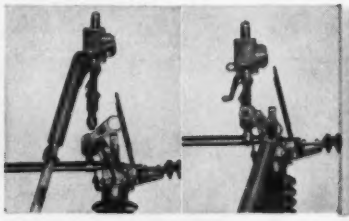
The ARI-60 will greatly extend flexibility in system switching with low cost interruption of load, line charging, magnetizing or capacitive currents. Exhaustive testing in the Kearney Laboratory has proved consistent interrupting ability up to full 600 ampere rating.

PRICE? You'll be pleasantly surprised . . . this is the answer to low cost load switching.

ARI-60 Specifications and Features

- High Speed interruption independent of operator.
- Simple Hot Stick replacement of interrupter.
- Interrupts load currents to 600 amperes without external arc.
- Rotating blade breaks ice, dirt, or corrosion.
- High pressure silver-to-silver contacts.
- Weatherproof rotating stack . . . stainless steel ball bearings.

Featuring the
ARCO INTERRUPTER UNIT



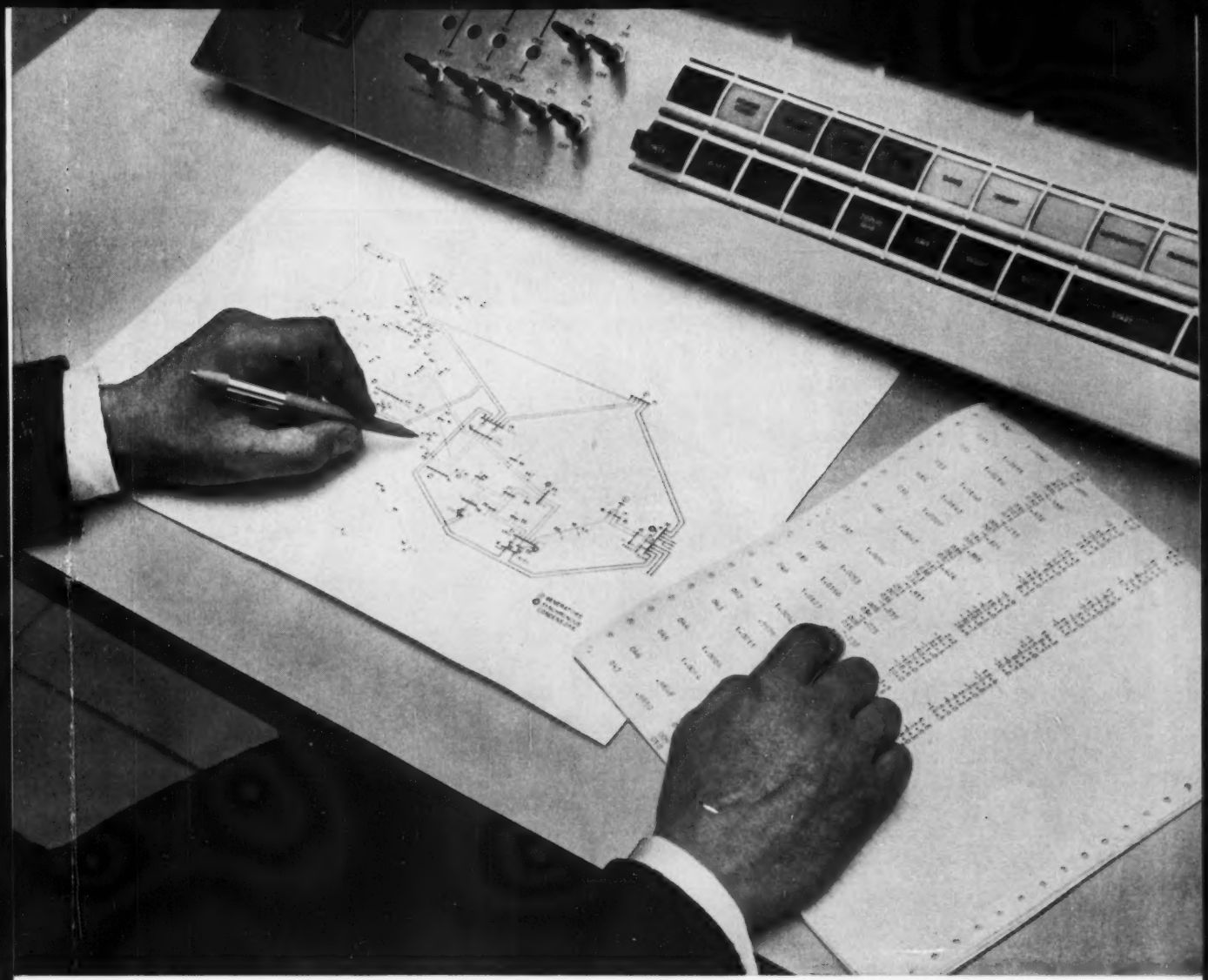
Simply and easily replaced in any position with a hot stick, cannot be installed incorrectly. Locking action holds unit so it can't vibrate free . . . *tested to 50 full load operations.*

For full details ask for Bulletin Section 8c.

KEARNEY

JAMES R. KEARNEY CORPORATION
MELROSE PARK DIVISION • 25TH & DIVISION STS., MELROSE PARK, ILL.

PLANTS IN ST. LOUIS • MELROSE PARK, ILL. • FAYETTEVILLE, ARK. • GUELPH, ONT., CANADA • ST. THERESE, QUEBEC, CANADA



Solve load flow studies in minutes with the low-cost IBM 1620

Now you can solve your system base case (up to 150 buses and 240 lines) in less than an hour... additional cases in minutes.

How? With the new Load Flow Program* for the IBM 1620 Data Processing System.

You simply enter the scheduled power input and voltage magnitude—or real and reactive loads at the terminals into the computer.

Your solid state 1620 automatically computes—and prints out fully or selectively—complete data on: *Voltage and angle • Net power • Load and generation • Line flows.*

You get direct entry to the base case for changes in loads, generation, transformer taps and capacitors. You can interrupt computation at any time to evaluate progress. And, because your 1620 produces complete data on cards or tape, you can run supplementary system studies at any time without having to solve the base case again.

Your local IBM Representative can give you all the facts. Call him.

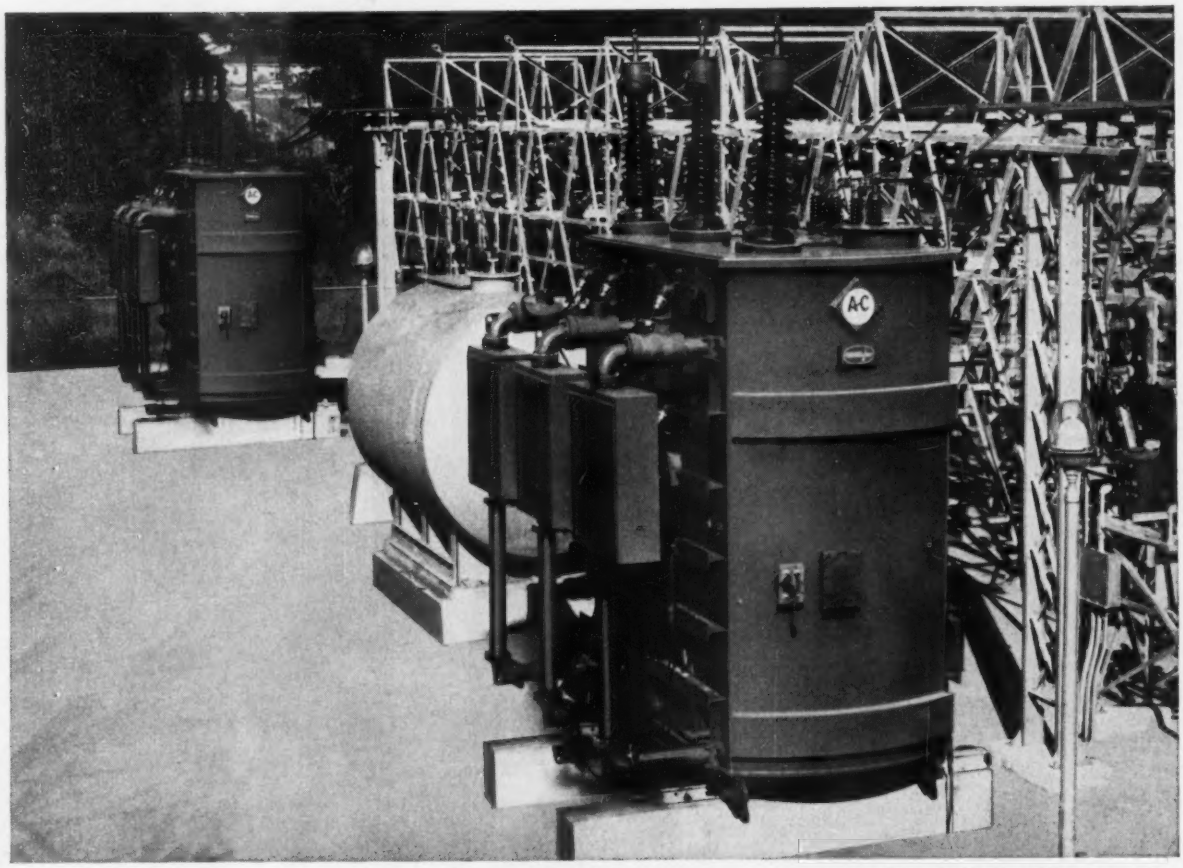
*The IBM 1620 Load Flow Program is only one of many from IBM's extensive Program Library that now includes FORTRAN and GOTRAN. These free programs help you solve utility engineering design, system planning and operating problems, with a minimum of programming.

The IBM 1620 is a compact desk-size computer.

IBM®
DATA PROCESSING

ALLIS-CHALMERS

A-1461



Gulf Power Company's Bayou Chico Substation, Pensacola, Florida, uses 20,000-kva DUAL-COOLED transformers.

33% greater capacity

Dual-Cooling uprates either of two 20,000-kva transformers to 26,667 kva

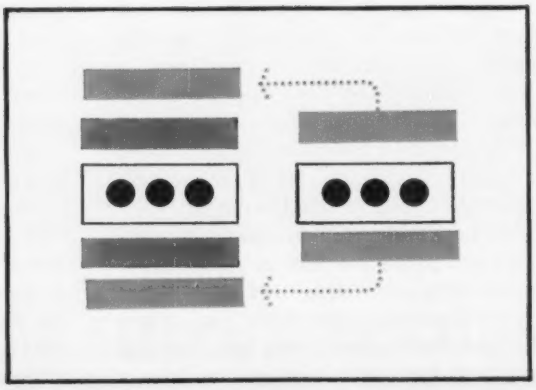
Now *Dual-Cooled* transformers offer both central stations and substations new opportunity to purchase *more* transformer capacity for *less money!*

With A-C dual-cooling, either of two 20,000-kva transformers, for example, can continuously carry 26,667 kva without loss of life.

Here's how it's done. In the event one transformer is off the line during an emergency, coolers from both units are connected to the functioning transformer. Emergency capacity of either *Dual-Cooled* transformer is increased one-third over its normal rating.

Dual-Cooled transformers are offered in any rating from 20,000 kva up. Contact your nearby A-C office for *Dual-Cooled* transformer application facts or write **Allis-Chalmers,** Power Equipment Division, Milwaukee 1, Wisconsin.

Dual-Cooled is an Allis-Chalmers trademark.



In dual-cooling, a transfer of coolers from one transformer to the other uprates the active transformer capacity 33%.

Electrical World

MAY 29, 1961
Vol. 155, No. 22

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THOMAS A. EDISON ENTERS the Hall of Fame.

The Electrical Week

LATE NEWS ▶ **Explosion of accumulated gas** wrecks boiler at Arapahoe station of Public Service Co of Colo. Damage estimate is $250,000. No service interruption.

Possible agreement on joint development of huge Bridge Canyon project by Arizona Power Authority and City of Los Angeles shows up in FPC hearing.

REA approves $14,683,000 G&T loan to South Texas Electric Co-op for a 44-Mw plant and 883 miles of 69 and 24.9-kv line. Plans are not available to investor-owned utilities in area to check on possible duplication. The new plant, to be near Goliad, will have four 11-Mw gas turbine units. It will be tied to 66-Mw plant being built by Medina Electric Co-op. Six co-ops form South Texas.

Lack of quorum stalls action on Burns Creek by House Reclamation subcommittee. Same cause forced postponement last spring.

Hanford power would be marketed under Atomic Energy Act instead of preference terms of Bonneville Power Administration, according to C. F. Luce, BPA administrator. He says companies buying Hanford power would not be subject to five-year cancellation clause.

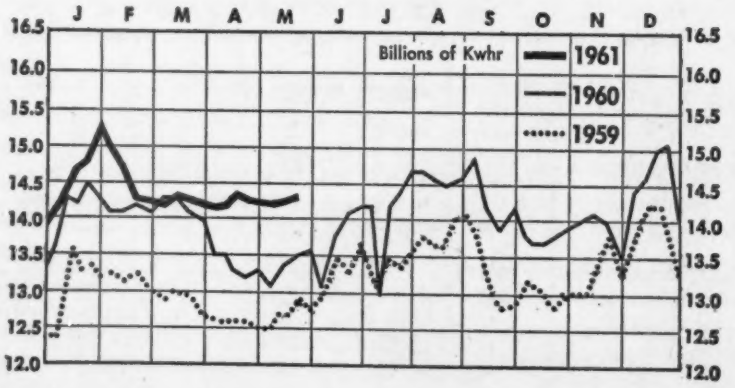
President Kennedy asks Interior Secretary Udall to review IJC findings on Passamaquoddy. He wants search for information reversing decision on feasibility.

Willis Gale, chairman of Commonwealth Edison, tells stockholders that while "there can be no reasonable objection to uniform prices if they are arrived at without collusion . . . identical bids are frustrating to a buyer and I don't know how he can tell whether uniform prices have resulted from competition or collusion." He also said that while damage suit liabilities "are likely to be substantial," he didn't think the basic financial integrity of the manufacturers "will be seriously impaired."

Full FPC denies alternate application of Washington Public Power Supply System to build High Mountain Sheep project. Final arguments scheduled for June 12.

First civil antitrust consent decree handed down involves C. H. Wheeler Mfg Co in the steam condenser case. Decree prohibits selling at "unreasonably low prices" that would tend to injure competition, and requires itemizing the condenser price in any "turnkey" or combination bids. These provisions will probably be included in remainder of consent decrees yet to be signed by other 28 manufacturers involved in the 19 Philadelphia civil antitrust cases.

WEEKLY POWER OUTPUT—Up 3.8% (Week ending May 20), Kwhr 14,352,000,000



Percent Change From Previous Year

	May 6	May 13	May 20
Total U. S.	+ 5.3	+ 4.1	+ 3.8
New Eng.	+ 7.4	+ 6.4	+ 6.7
Mid. Atlan.	+ 5.5	+ 4.9	+ 4.4
Cent. Indust.	+ 1.7	− 0.7	+ 1.2
West Cent.	+ 4.5	+ 5.2	+ 5.4
Southeast	+ 4.7	+ 2.4	+ 2.7
South Cent.	+11.4	+12.8	+ 8.5
Rocky Mount.	+ 8.0	+10.5	+ 7.7
Pacific			
NW	+ 3.7	+ 7.0	− 1.9
SW	+11.5	+ 6.9	+ 8.1

Seasonally Adjusted Index 290

Week Ago 290 Year Ago 279

Source: Edison Electric Institute

Supply Lines

LAPP REDUCES INSULATOR PRICES, GOES TO QUANTITY DISCOUNTS

Lapp Insulator Co reduced prices on suspension insulators May 22. The reductions, which apply to all orders on the books at that time, are, as examples, from $3.25 to $2.92 on 10-in., 15,000-lb units, and from $4 to $3.70 on 10-in., 25,000-lb units. At the same time, the company has instituted a quantity discount policy based on weight, so that the new prices quoted above are for shipments 24,000 lb and larger. For small shipments, the new prices are $3.05 and $3.85, respectively. Lapp says it is continuing "its long-standing policy of selling at a single published price to all customers," and emphasizes the reductions are "a temporary expedient to meet a commercial situation," i.e., the current softness of the market. The company says that steadily rising labor and material costs "will eventually require either higher prices or reduction of quality."

INVENTORY CUTS, PERFORMANCE MEASUREMENT ARE TOP STORES TOPICS

A utility stores practice that trimmed the inventory of one utility by some 56%; a comparison of inspection practices of new materials by electric utilities; and descriptions of various attempts to measure utility stores performance—these were the highlights from papers given by stores executives at the annual meeting of the Edison Electric Institute Purchasing and Stores Committee meeting in Houston, Texas, earlier this month. More than 130 committee members turned out to share experiences and conduct a searching self-examination of their own work performance. Report on the purchasing segment of the meeting will be carried in this space next week.

CONNOLLY

Tampa Electric Co trimmed its materials and supplies inventory from $2,190,000 in 1956 to $918,000 as of the end of last month by making heavy use of local vendor stock. Robert F. Connolly, purchasing agent for the utility, said the 1956 figure amounted to approximately $18 of inventory per customer. Last month's figure amounted to $6.15 per customer. And this heavy reliance on local vendors' stock has brought general commendation from the vendors, Connolly reported.

Tampa Electric uses repeating requisitions to draw on local vendors' stocks. Amount of material drawn at any one time ranges from a minimum of 15-days' requirements to a maximum of 30-days' requirements. The suppliers favored with blanket orders agree to put 120 days' usage in stock and when this amount is reduced to 60 days' usage, they agree to restock to 120 days. The local suppliers also furnish the utility with current inventory stock lists each Monday morning reflecting the balance on hand as of the previous Friday. This list includes all items in vendors' stock whether or not they are covered by a blanket order.

Among the advantages cited by Connolly: Savings of approximately 7½% as a result of better prices on standard items bought under blanket orders, fewer purchase orders, smooth relations with local vendors, and some $85,000 in state sales tax savings. One disadvantage cited by a supplier: If a vendor fails to win a blanket order, he is in for a long dry spell.

Most utilities provide some kind of inspection system for determining quality and performance of equipment and materials purchased, and all utilities provide some kind of inspection to determine when used materials or equipment should be removed from service. An EEI Purchasing and Stores task force, led by W. S. Marks, Commonwealth Edison Co, obtained this picture of utility inspection practices from a survey of 84 investor-owned utilities:

MARKS

- 21% of the companies, mainly the larger ones, have full-time inspectors.
- 60% of the utilities responding make detailed inspection of materials either purchased to their own specifications or on other selected items. These inspections are made in some instances at manufacturing plants and in other cases upon receipt.
- 94% of the utilities thoroughly inspect all wood products (poles, crossarms, lumber, wood ladders) to insure receiving an acceptable product for reasons of safety and durability.
- 90% of the companies inspect all material when received.
- 50% use the "sampling method" for inspections and report this procedure is satisfactory.
- Nearly 70% of utilities responding reported they inspect distribution transformers, either to a minor extent or make extensive electrical and laboratory tests.
- 60% of the utilities concluded that costs of making inspections is economically justifiable; 18% of the companies believe it justified to make inspections occasionally; 16% say inspection costs cannot be justified.
- 30% of the utilities consider it worthwhile to make inspections at vendors' plants, with another 26% stating it should be done on an occasional or limited basis. 40% indicated that it is not worthwhile for their companies to inspect at suppliers' plants.
- All utilities responding inspect materials removed from service to determine condition for reuse or recommended disposition as saleable or junking.

REMALIA

Tips for improving material requirements forecasting came in a paper by G. A. Remalia, Duquesne Light Co. Drawing from a survey made by another Purchasing & Stores task force, Remalia reported these practices: (1) Through item analysis, one utility has found that 10% of its items make up most of the forecasting problems. By isolating and directing attention to this 10%, the problems were greatly simplified. (2) Another company reports that material forecasts are tied in with manpower and workload forecasts as related to historical data of material uses. (3) Still another company reports that established emergency minimums of material are maintained to cope with seasonal storm demands and are then permitted to drop back to normal.

Effective forecasting of material requirements demands interdepartmental coordination well beyond the confines of purchasing and stores departments, Remalia asserted. Also involved are planning, budgeting, engineering, accounting, construction, operations and possibly others, he said.

Controversy developed over methods for measuring utility stores performance, with a number of members holding that no meaningful comparison between companies is presently possible. M. A. Edwards, Duke Power Co, outlined a stores performance comparison that he uses for measuring the relative performance of area storerooms in his utility. George J. Kleinpell, Cleveland Electric Illuminating Co, argued that an inventory control analysis could be worked out that would be useful in comparing the relative performance among various utilities, but W. N. Fairlee, Pacific Gas & Electric Co, held that practices vary to such a degree among utilities that a meaningful comparison of stores performance is almost impossible.

HORACE E. BISHOP, peach and dairy farmer of Inman, South Carolina, tells Duke Power's Edwin O'Shields how the L-M Suburbanaire adds hours to his day, beauty and safety to his home.

THE ADDITION of this L-M Suburbanaire now permits launching and reloading of boats at Lee's Boat Haven, near Clover, South Carolina, any time of the day or night.

Duke Power Provides Low-Cost Lighting For Piedmont Carolinas

Rental plan for suburban and rural areas offers low-cost protective and convenience lighting for farms, filling stations, small townships.

The extensive Duke Power Company system includes 33 branches from the Virginia line to the southern boundary of South Carolina. One important aspect of this progressive utility company's merchandising and public relations program has been to sell its customers on better outdoor lighting.

To make such lighting available at low cost, Duke Power Company offers its customers individual photocell-controlled luminaires, such as L-M's Suburbanaire, on a full-service contract. For $3.00 a month, the company supplies the unit itself with a 7000 lumen mercury vapor or 6000 lumen incandescent lamp, pole, installation, service, and power, on a rental basis with a service contract.

The lighting plan is widely used in the Company's territory at farms, service stations and garages, industrial areas, and for small township street lighting jobs. Under the plan, which has been in operation only since October, 1958, the utility has several thousand units in service.

How-To-Do-It Information

For details on how Duke Power Company and other utilities have put the plan into operation, ask your L-M Field Engineer or Lighting Engineer; or write Line Material Industries, Milwaukee 1, Wisconsin. In Canada: Canadian Line Materials Ltd., Toronto 13, Ontario.

THE L-M SUBURBANAIRE is a specially designed, easy-to-maintain open-type unit, available with photocell and for either incandescent, or with ballast for mercury vapor lighting. High efficiency is achieved with scientifically designed reflector-refractor combination. Available in IES types I, II, III, V, and 4-way type II light patterns.

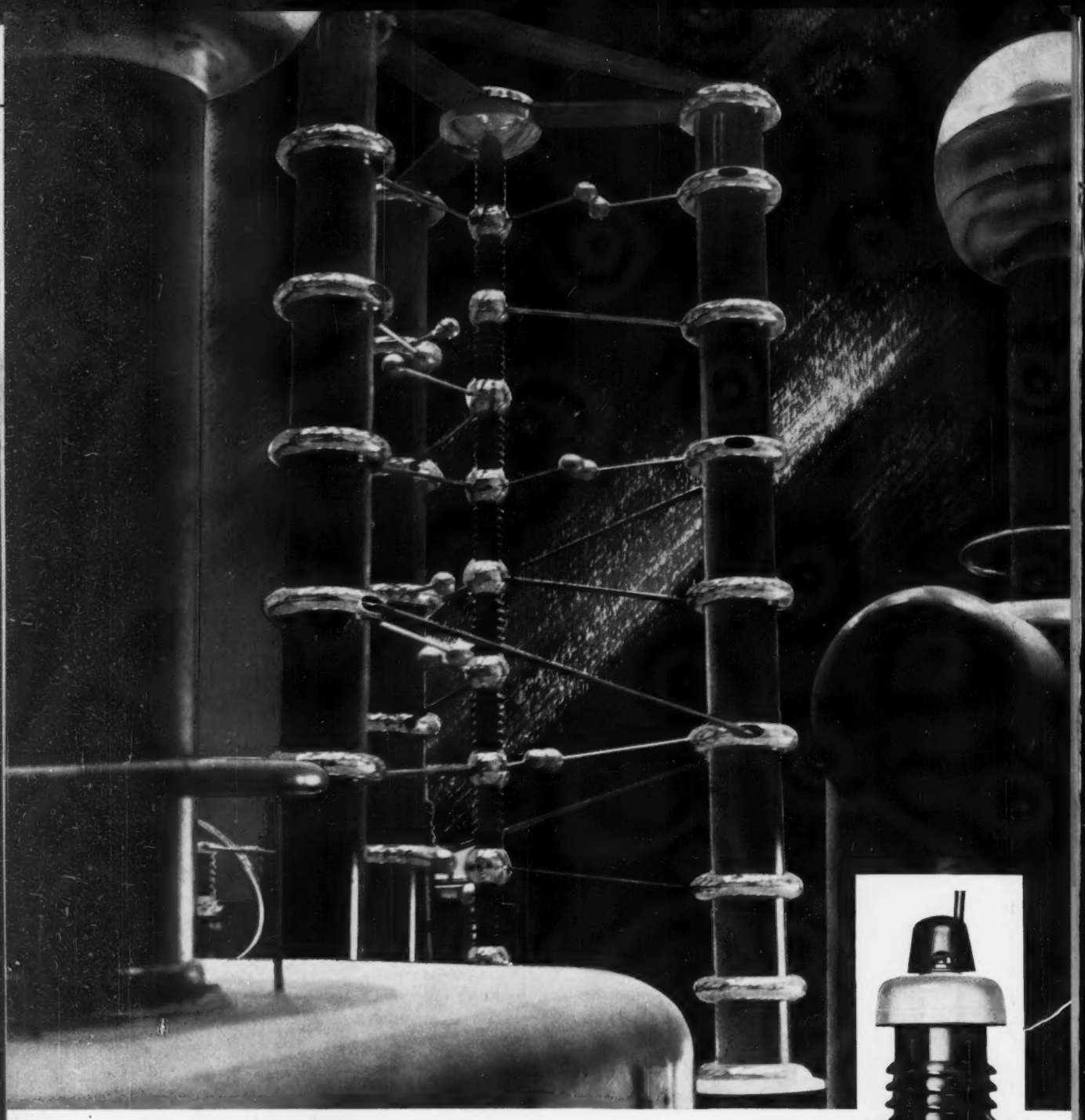
404

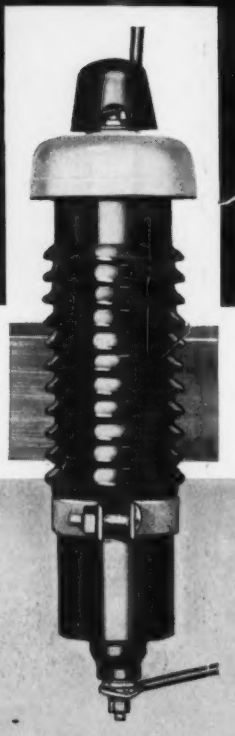
LINE MATERIAL® Industries Outdoor Lighting

McGRAW-EDISON COMPANY

DISTRIBUTION TRANSFORMERS • KYLE RECLOSERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS
POWER SWITCHING EQUIPMENT • PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING
LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT

McGRAW EDISON





L-M's revolutionary new E-5 distribution arrester is possible only because of L-M's 20 years of experience in system protection, its 2,000,000 arresters in service, and the knowledge of lightning gained through many laboratory facilities, such as the new high voltage laboratory, a portion of which is shown here.

OUR 50TH YEAR LM 1911 — 1961

LINE MATERIAL® Industries

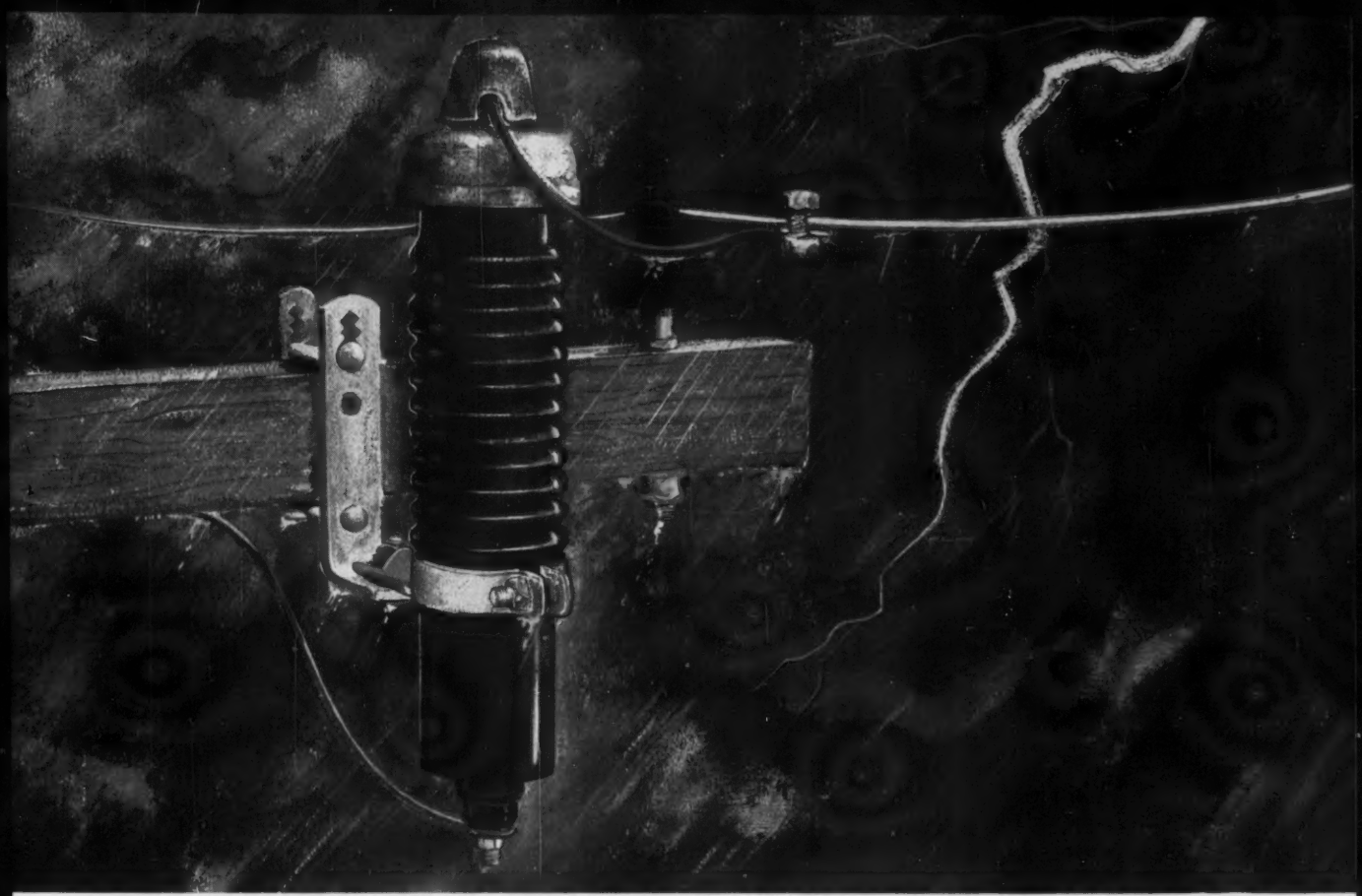
McGRAW-EDISON COMPANY

Lightning Arresters

McGRAW EDISON

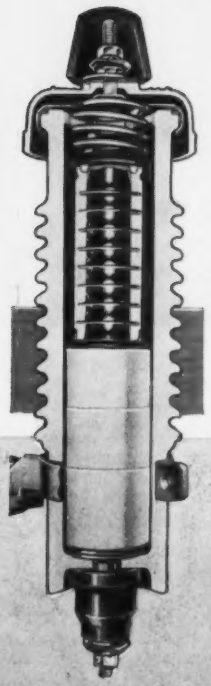
514

DISTRIBUTION TRANSFORMERS • RECLOSERS, SECTIONALIZERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS
LIGHTNING ARRESTERS • POWER SWITCHING EQUIPMENT • PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS
OUTDOOR LIGHTING • LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT



THE TYPE E5 DISTRIBUTION ARRESTER. Compact, efficient, with better electrical characteristics. Excellent long-life protection. Also available in externally gapped (T5) design. Ask the L-M Field Engineer for details, or write Line Material Industries, Milwaukee 1, Wisconsin. In Canada: CLM Industries, McGraw-Edison (Canada) Limited, Toronto 13, Canada.

L-M Offers Concept Of Total System Protection With New Type E5 Arrester



New distribution arrester design with high-intensity copperized valve blocks provides low sparkover and low discharge voltage; retains excellent thermal and follow-current characteristics.

Adequate lightning protection consists of low sparkover and discharge voltage, for safe margin; high thermal capacity, for long life; low follow current, for minimum system disturbance; and universal system application, unlimited by available 60 cycle fault current magnitudes.

None of these factors can be considered separately. All apply equally. This, then, is the total concept of lightning protection which Line Material introduces in its Type E5 distribution arrester. Thus, when you buy the Type E5 arrester, you get balanced, lasting protection resulting in low total costs.

CUTAWAY VIEW OF THE E5 (T5 internal construction is similar) shows the long-life ladder gap, valve element of copperized, ceramic-coated silicon carbide blocks that provides low sparkover, high discharge capacity, fast response, with outstanding current limiting characteristics. Be sure to ask your L-M Field Engineer for more information.

OUR 50TH YEAR 1911 — 1961

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LINE MATERIAL® Industries

McGRAW-EDISON COMPANY

Lightning Arresters

McGRAW EDISON

DISTRIBUTION TRANSFORMERS • RECLOSERS, SECTIONALIZERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS
LIGHTNING ARRESTERS • POWER SWITCHING EQUIPMENT • PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS
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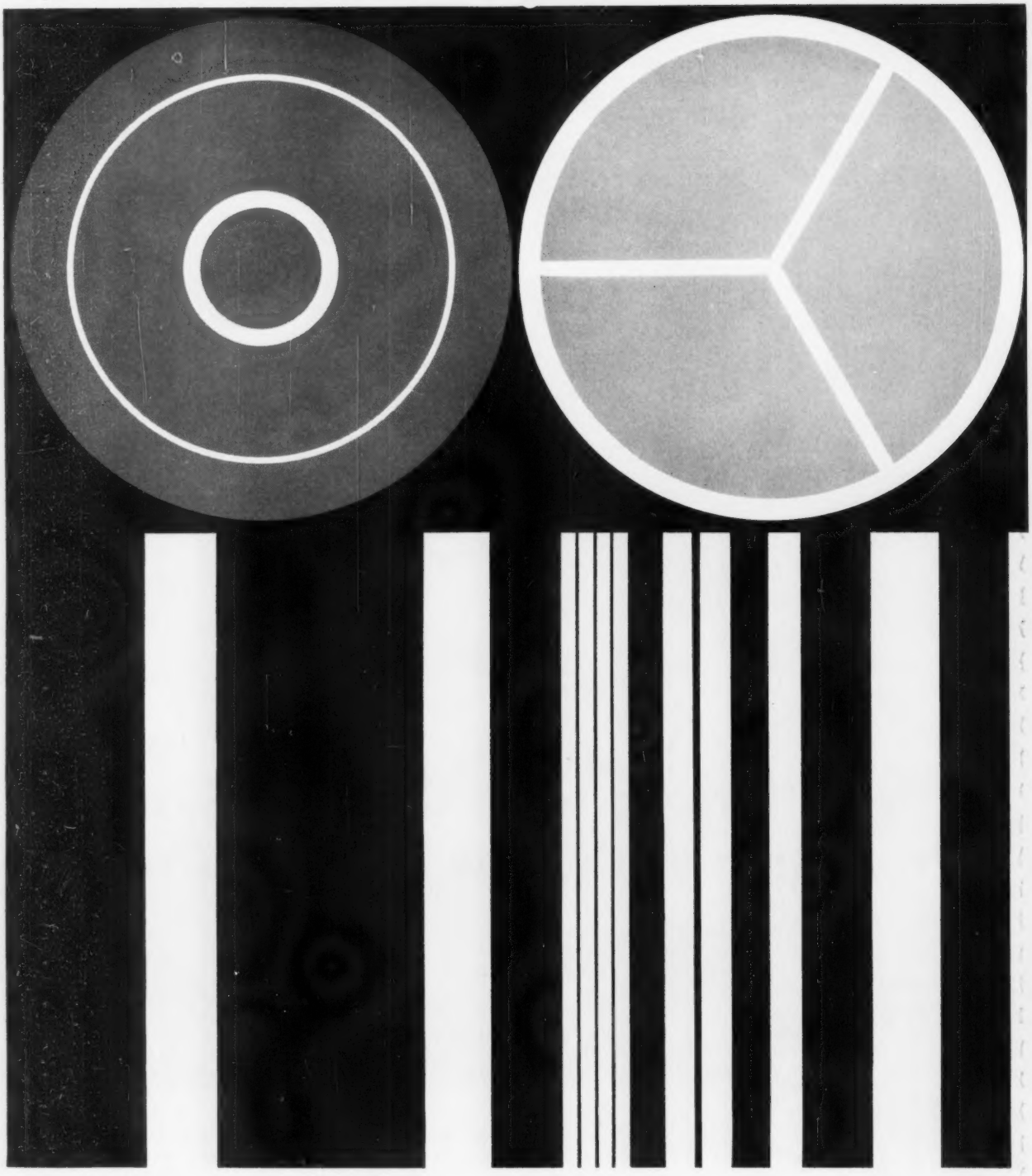
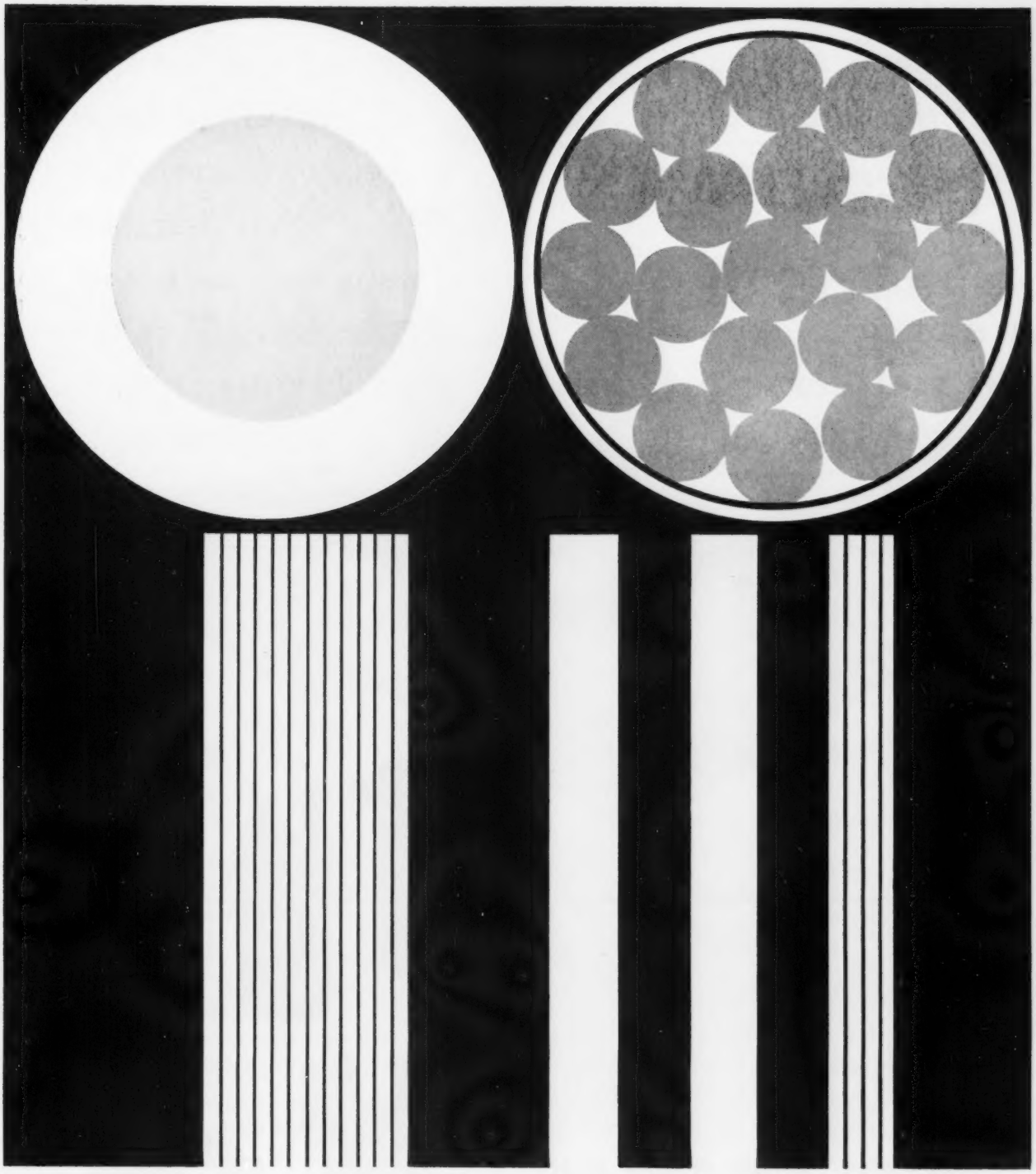
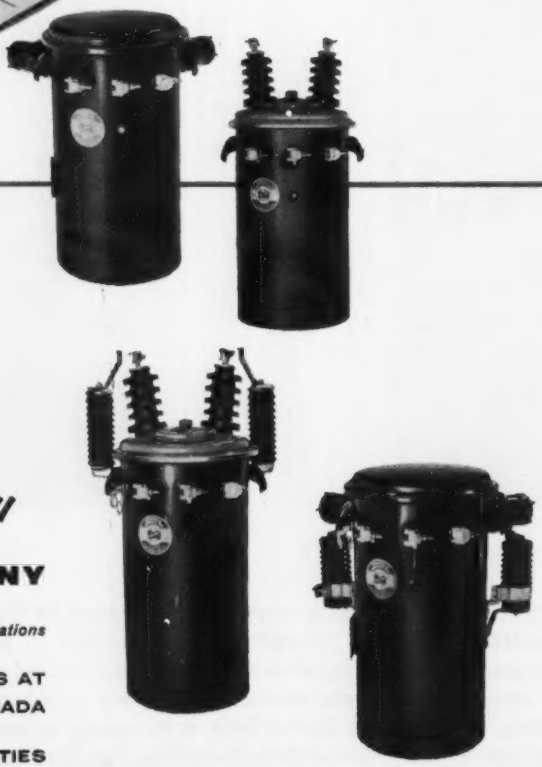




GROWTH—Nothing is more certain than the growth of the utility industry. Total capability should reach 200,000 megawatts by 1964. □ General Cable helps pace this growth with a full line of wire and cable products...and with continuing programs of expanded research and manufacturing, as well as improved supply facilities. As utilities grow, so grows General Cable, in its capacity to meet demands for any wire and cable products. General Cable Corporation, 730 Third Avenue, New York 17, N.Y.

GCC
GENERAL CABLE CORPORATION

THE DIFFERENCE SHOWS UP HERE



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MOLONEY ELECTRIC COMPANY

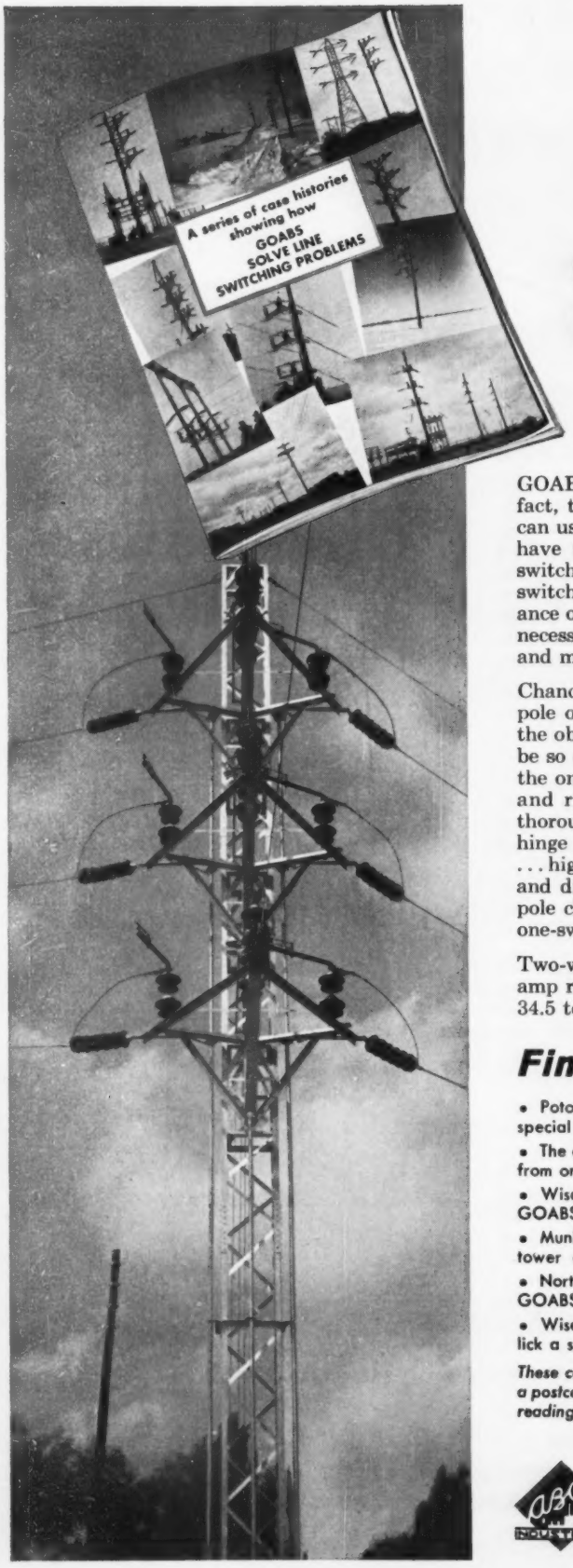
Manufacturers of Transformers for Utilities, Industry and Electronic Applications

FACTORIES AT
ST. LOUIS 20, MISSOURI AND TORONTO, ONTARIO, CANADA

SALES OFFICES IN ALL PRINCIPAL CITIES

Your records know the difference between distribution transformers having a marginal design or a single outstanding feature—and distribution transformers having a well balanced design. If these records could speak they would tell you Moloney's Distribution Transformers give the tops in system efficiency, dependability and economy. Check the following Moloney features against the record—see how Moloney Transformers can hold down your costs and give a high rate of return on your investment.

MOLONEY FEATURES	YOUR BENEFITS
Low core loss • Low exciting current Low copper loss	LOW OPERATING COST
Low impedance—good voltage regulation High overload capability	INCREASED REVENUE
Duracoat Insulated Covers • High Impulse strength Designed to withstand full short circuit Extra insulation at all vulnerable points of the coil	FEWER OUTAGES
High strength bushings • Sealed tank • Inhibited oil Tough weather resistant paint No external bushing mounting hardware Cover fashioned to shed moisture Heavy gauge steel tank and cover	MINIMUM MAINTENANCE
New shipping enclosure—reduces scrap—facilitates readying for installation Transformer banded to shipping base for ease of handling after enclosure is removed	EASE OF HANDLING
Smoothly contoured hooks prevent sling abrasion AL-CU Connectors • Single bolt handhole closure Insulating cap on sidewall mounted H. V. bushings for clamping conductor without tools	QUICKLY INSTALLED
Low sound level • Dependable service No radio frequency interference	SATISFIED CUSTOMERS



Chance

GOABS do solve many Line Switching Problems

GOABS are not just problem-solving specialty switches. In fact, they are the most efficient and economical means you can use for any tap switching arrangement. But many users have found them particularly valuable in solving specific switching problems like right-of-way restrictions; need for switch controls at one location; demand for improved appearance of lines, less clutter with fewer equipment installations; necessity of making provisions for future expansion of circuits and many others.

Chance GOABS phase above phase installation on a single pole or supporting structure for 1, 2 or 3-way switching is the obvious answer to such problems. Benefits that may not be so obvious without careful checking and comparison are: the one piece welded aluminum frame designed for strength and rigidity so necessary for smooth switch operation, thoroughly tested and field proven . . . sealed silver to silver hinge contacts . . . high pressure straight line jaw contacts . . . high speed arcing horns . . . maintenance free bearings . . . and direct-operating vertical control rods easily located for pole clearance without universal joints that impede smooth one-swing opening or closing.

Two-way and 3-way GOABS are available in 400-600-1200 amp ratings, 7.5 to 69 KV; 1-way in 600-1200 amp ratings, 34.5 to 69 KV.

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- Municipal Public Utilities of Brownsville, Texas installed an aluminum tower and 3-way GOABS (shown at left) in a single day.
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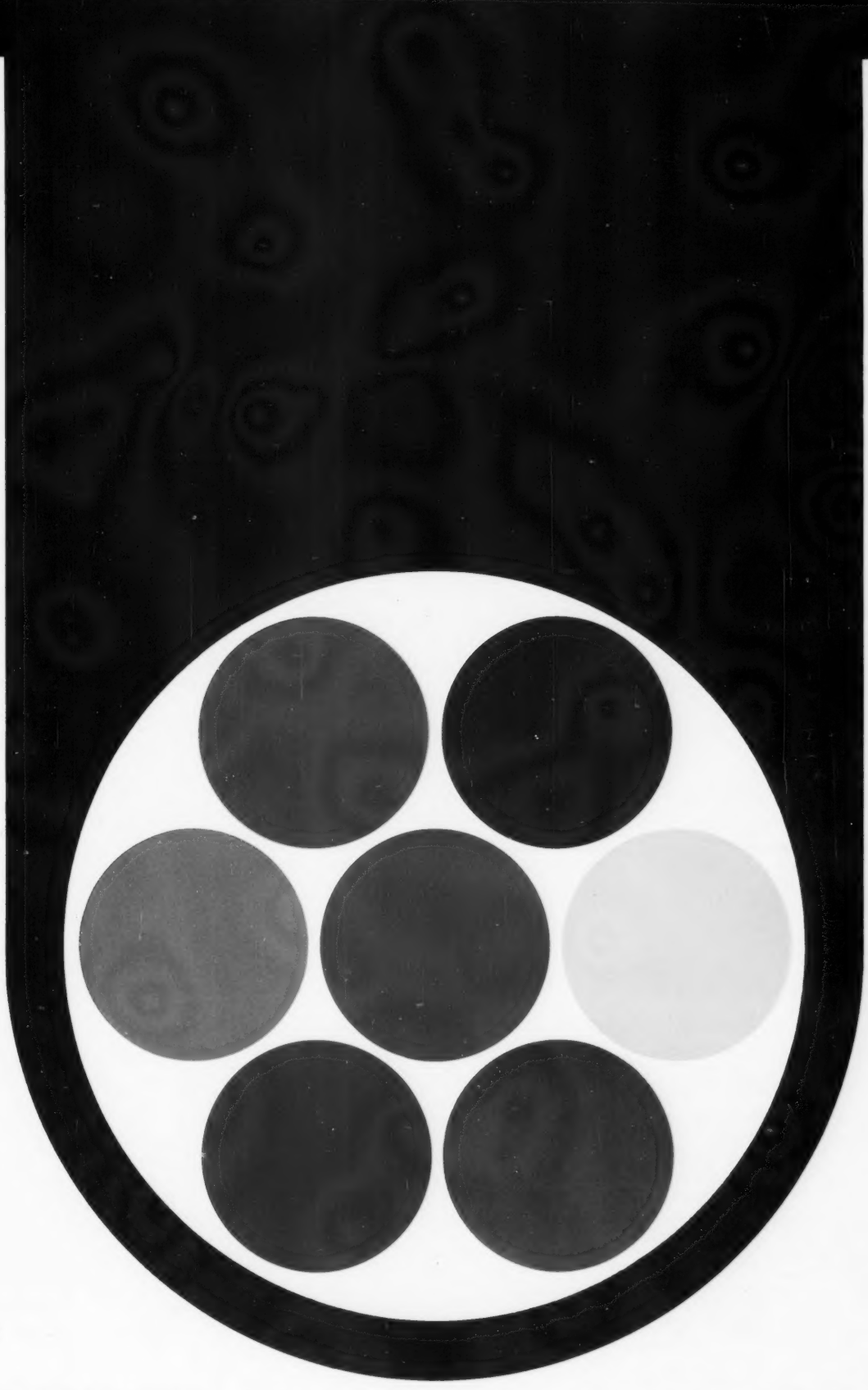

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HERE'S HOW VALUE RATINGS WORK:

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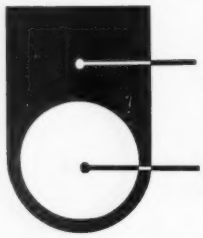

FOR POWER CABLE the standard is IPCEA test requirements for the types of insulation and jacketing specified. Compared to the 100% of IPCEA requirements, Kaiser Grizzly® power cable earned a Value Rating of 270% in the full series of tests.

FOR PORTABLE CORD the standard is the service-per-dollar figure for the least expensive cord (low-priced C.V.). Kaiser Master Laytex® Spec. 920, with five times the life, has Value Rating of 308%—more than three times the service per dollar.

FOR CONTROL CABLE the standard is a composite of recognized minimum specifications for eight important insulation characteristics. This measures overall values. It makes no attempt to rate the specialized qualities of the many individual K/W control cable specifications.

For detailed information on the Value Rating methods—with evaluations of Kaiser Wire power cables, portable cords, and control cables—mail this no-postage form. Check the Value Rating bulletins you would like to receive.

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Please give me the new bulletins showing K/W Value Rating data. I am interested in

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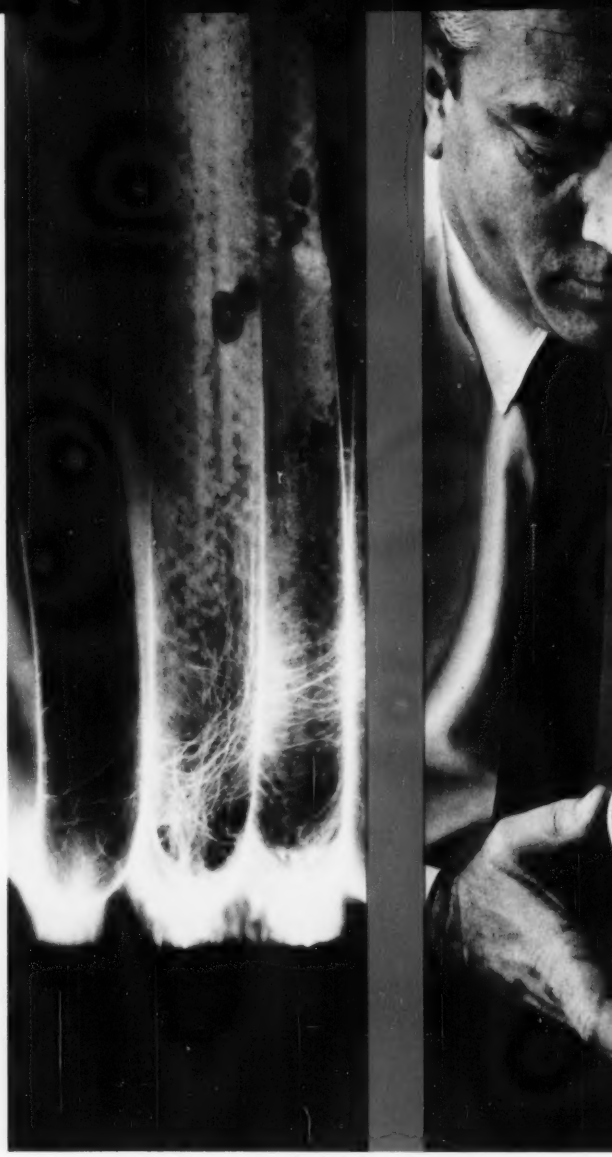


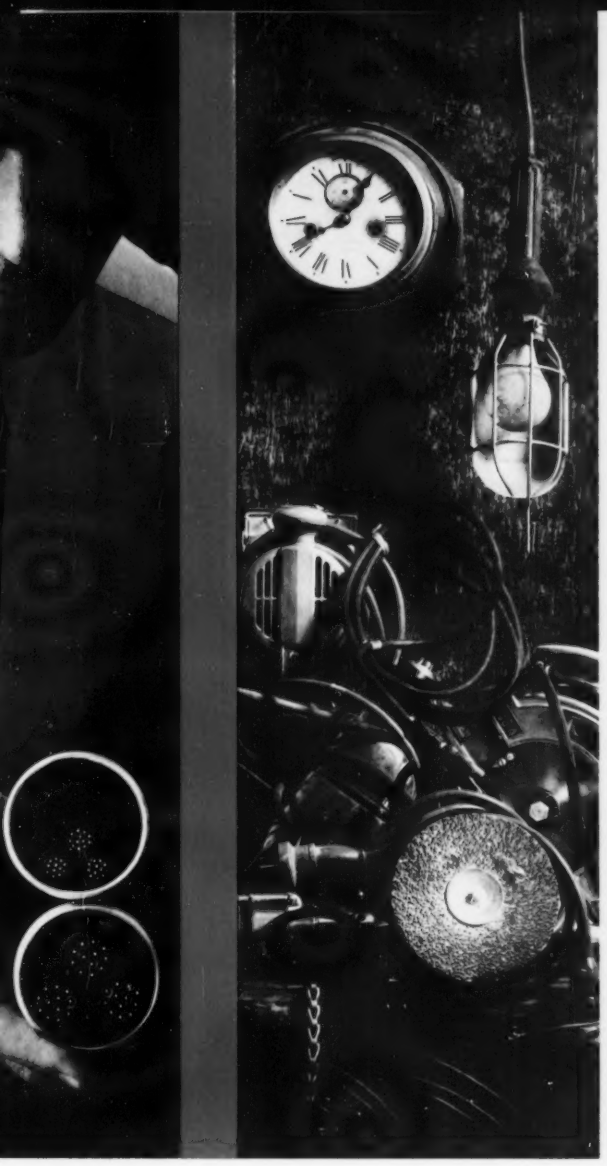
KAISER GRIZZLY® STANDS UP LONGEST IN EVERY OZONE TEST

Year after year, Kaiser Wire engineers check the relative ozone resistance of leading 5KV unshielded cables in "U" bend tests—with 40,000 V. potential between conductor and grounded plate. These tests prove Kaiser Grizzly Power Cable lasts at least twice as long as the best competitor . . . sixteen times longer than the test average. Kalzone® Insulation used on Grizzly cables surpasses IPCEA ozone resistance minimums by more than twenty times in tests.

KAISER CONTRO MORE CIRCUITS IN

The picture above diate value of Ka control cable—sma conduit at top, wit Resin, has room f cuits. A comparabl cable does not. Pe important is the re ord of Kaiser co trol cable's famou Laytex insulation service unmatche by any other insula tion—thirty years resistance to moist ure, aging, and phy ical damage.

IN COPPER AND ALUMINUM CABLES . . . THE SPARK



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K/W LAYTEX-RESIN CONTROL CABLE
VALUE 767% RATING

KAISER MASTER LAYTEX® CORD ELIMINATES 4 OUT OF 5 REPAIRS

A single Kaiser Master Laytex portable cord can last as long as five average cords. Reason: its patented fibrous core and Laytex insulation (natural rubber applied in original liquid form) give it a flexing-life up to *twelve times* as great as other portable constructions. This eliminates as much as $23 in future tool connection labor — each time you connect a Kaiser Master Laytex cord. The Value Rating shows the service you receive per dollar you spend.

K/W MASTER LAYTEX PORTABLE CORD
VALUE 308% RATING

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NEW "VALUE RATINGS"

. . . GIVE IMMEDIATE COMPARISONS OF K/W CABLES AGAINST COMPETING CABLES AND IPCEA STANDARDS!

They will serve you as useful guides to better purchases of both copper and aluminum cable constructions. Turn the page for details. . . . . .

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Typical of the runners for the Francis-type turbines being built by B-L-H for Appalachian Power's Smith Mountain Dam

Appalachian Power turns to B-L-H for turbines

Indicative of B-L-H's work with private utilities is the Appalachian Power Company's new project on the Roanoke River in Virginia. Two power-generating dams are being constructed. Both will utilize B-L-H turbines.

For the upper dam, located at Smith Mountain Gap, B-L-H will furnish two giant Francis-type turbines. Each is rated at 204,000 hp when operated at 100 rpm under 179-ft. head. So massive are the runners—in excess of 20 ft. in diameter and weighing over 140 tons—that they will have to be shipped to the dam in halves.

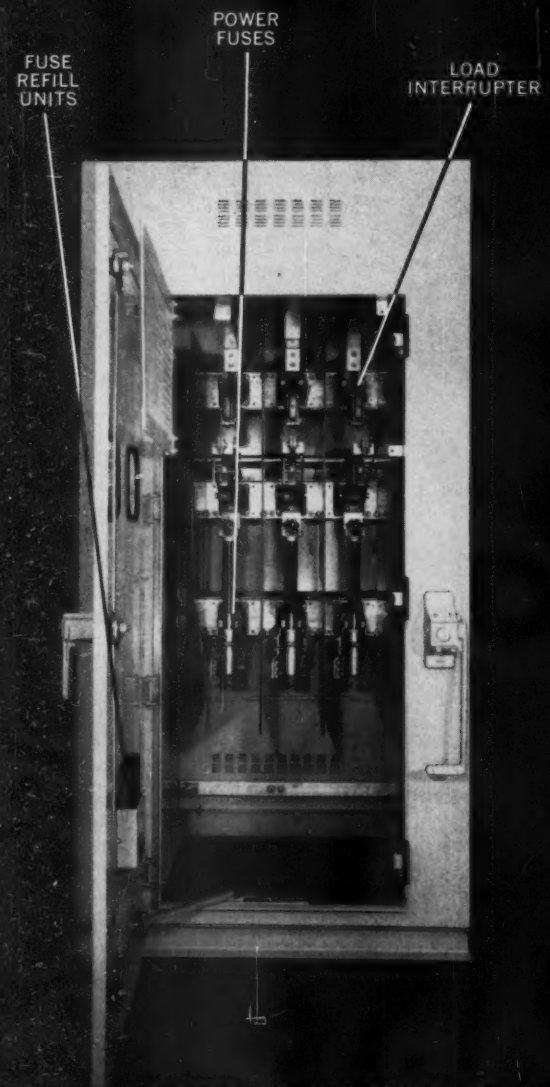
For the lower dam, near Leesville, B-L-H is building two fixed-blade propeller-type turbines. Each is rated at 32,300 hp when operated at 138.5 rpm under 65-ft. head.

In addition to all four basic types of turbines, B-L-H manufactures governors, surge suppressors, valves, special pumps, and other accessory equipment. For more information and a free copy of our illustrated Turbine Bulletin 1002, write B-L-H Corporation, Philadelphia 42, Pa., or Pelton Division (B-L-H), 2929 Nineteenth St., San Francisco 10, Calif.

BALDWIN · LIMA · HAMILTON

Industrial Equipment Division · Philadelphia 42, Pa.

Reclosing is for the birds



Open view of a typical S&C Metalclad Switchgear bay. Note power fuses, load interrupters. Fuse refill units are conveniently stored in the door.

So why buy this feature in your 2.4 thru 14.4-kv switchgear?

Reclosing is for the birds, squirrels, tree limbs, lightning, icing, windstorms, and kite strings that frequently cause non-persistent faults on open distribution lines of utility systems. Reclosing re-energizes the lines to restore service in a fraction of a minute.

But when faults occur on the enclosed power supply circuits of industrial plants, commercial and institutional buildings, you don't want to reclose on them. These faults —while extremely rare—are permanent. Someone has to locate the trouble and repair the equipment or cable—or at least isolate it—before the system can be re-energized. So why buy expensive circuit breaker type switchgear with its automatic reclosing feature?

S&C Metalclad Switchgear—employing fused load interrupters—gives the ideal protection for enclosed power supply circuits. Power fuses furnish the fault protection (load interrupters switch the load). After a fault occurs, you simply replace the inexpensive fuse refill unit (typically costing $13.50) while the fault is being located and corrected.

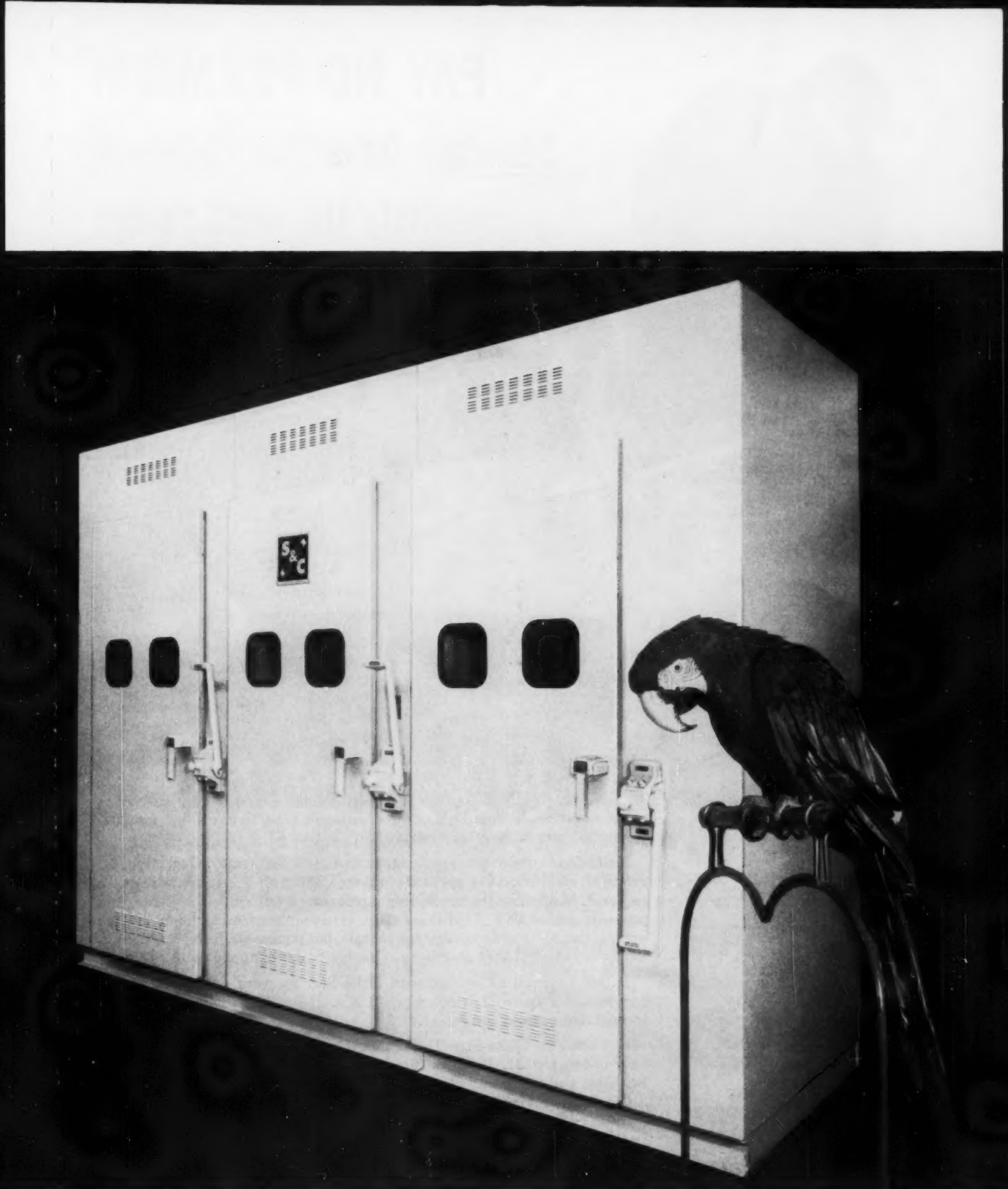
The economics all say, "Reclosing is for the birds." Why pay for a function you can't use?

Cut your high-voltage switchgear costs in half by specifying S&C Metalclad Switchgear for your 2.4 thru 14.4-kv switching centers, service entrances, substation primaries and secondaries. Get full-load switching to 1200 amperes and fault interrupting to 500,000 kva.

See the Yellow Pages (Electrical Equipment) for your nearest S&C sales engineer. Or write to:

S&C Metalclad Switchgear meets all NEC requirements for fault-closing, short-circuit interruption. Performance proved by high-power testing at KEMA laboratories.

S&C ELECTRIC COMPANY
4421 Ravenswood Avenue • Chicago 40, Illinois
Specialists in High Voltage Circuit Interruption since 1911



The equipment is an S&C Metalclad Switchgear Assembly rated 13.8 kv, for a switching center.
The bird, a green-winged macaw, is an optional extra, obtainable at your local petshop.

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Standard Delta-Star Potheads satisfy the most severe service requirements

Completely trapped Neoprene O-ring gaskets make a long life, leak proof, high pressure seal.

Standard Delta-Star Potheads stand up under pressures where ordinary potheads would fail. What's the secret? Exclusive neoprene O-ring seals throughout!

At no extra cost you can get the performance you need by specifying *standard* potheads from Delta-Star. You don't have to pay a big premium for special potheads in severe service applications.

Delta-Star terminators are designed and built differently. Gasketing, for example, is superior. Neoprene O-rings are used at all points where seals are required. Machining the precision grooves completely traps the O-ring and prevents gasket flow. This takes more care and manufacturing skill than preparation for use of ordinary flat gaskets, but it pays off. You get a tighter, longer lasting seal that stands up in severe pressure applications.

It will pay you to consult with Delta-Star for your cable termination requirements up to and including 46 KV. Delta-Star engineering service is available without obligation.

Get the new Delta-Star Terminator Catalog. Complete information in easy-to-use format. Includes internal and external connectors, porcelain bushings and insulating compound data. Write to *Delta-Star Electric Division, H. K. Porter Company, Inc., 2437 W. Fulton St., Chicago 12, Illinois.*

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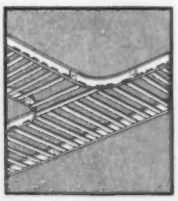
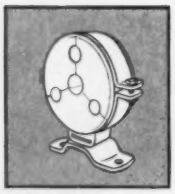
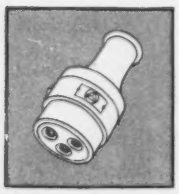


CABLE SUPPORT SYSTEMS



SPOOL CABLE SUPPORTS



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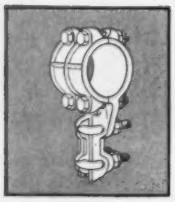

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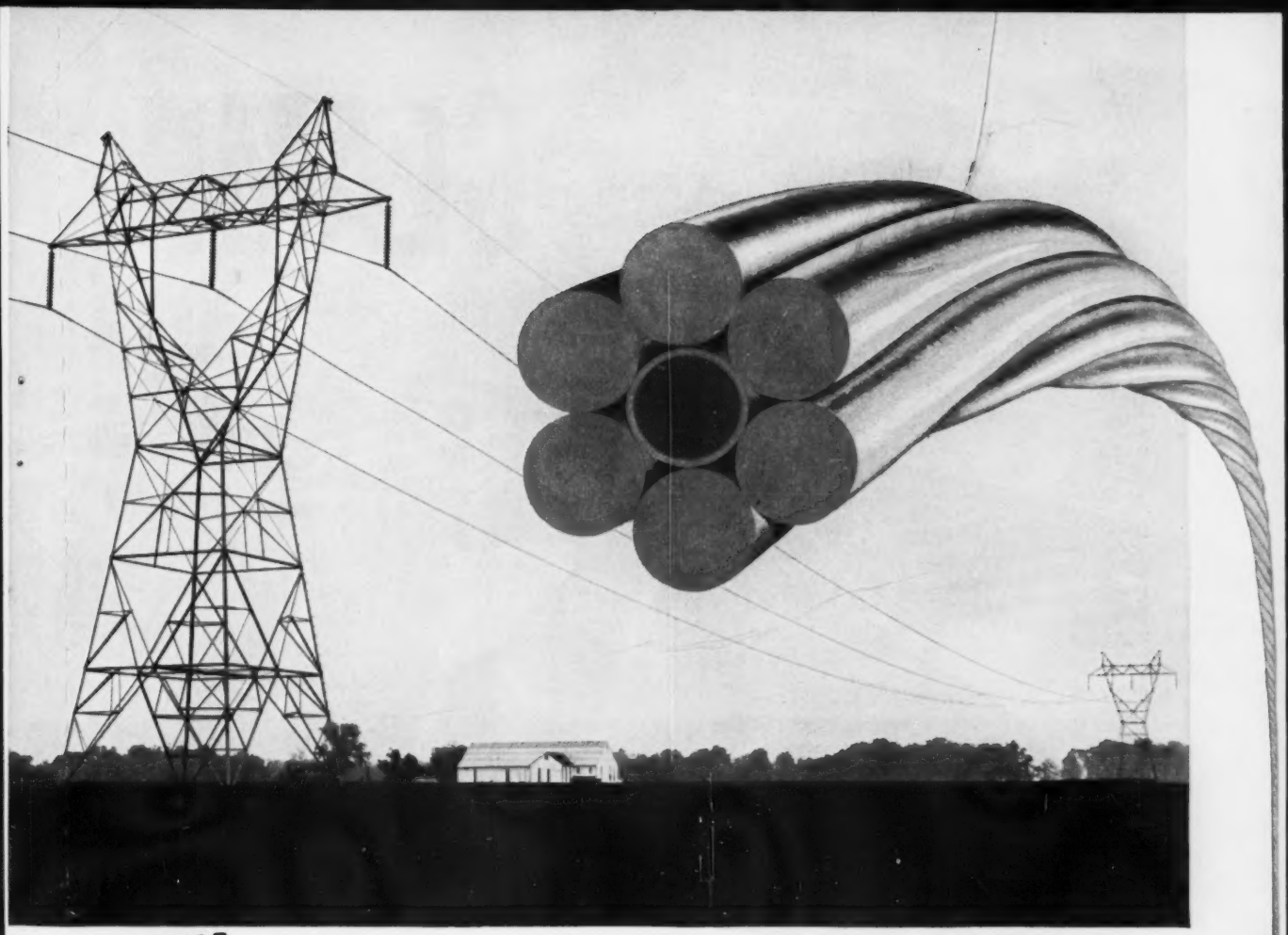

NEW Bethalume ACSR Core Wire

STEEL COATED WITH ALUMINUM COMBINES STRENGTH WITH HIGH CORROSION RESISTANCE

Bethlehem now offers Bethalume (aluminum-coated) ACSR core wire along with our two other types of core wires: our exclusive bethanized (electrolytic zinc-coated), and our hot-dip galvanized wire. This triple selection gives utility companies a choice to meet virtually every atmospheric condition.

And only Bethlehem can supply all three types for shipment from the same plant—in mixed cars at minimum carload rates.

Look at these advantages of Bethalume ACSR core wire:

MINIMUM MAINTENANCE AND LONG-LIFE of high-tension conductors is made possible by the combination of the coating's excellent corrosion-resistant properties with the high-tensile strength of steel.

IDEAL FOR HEAVY INDUSTRIAL AREAS because Bethalume's highly protective film of aluminum oxide effectively withstands corrosive atmospheres.

DEPENDABLE PERFORMANCE is assured because Bethalume ACSR core wire meets all requirements of ASTM Specification B-341.

EASY, TROUBLE-FREE STRANDING into standard aluminum conductors is possible because of the painstaking inspection, sizing, and cleanliness of the steel wire.

All three grades of Bethlehem ACSR core wire are available in sizes from .1878 in. to .0661 in.

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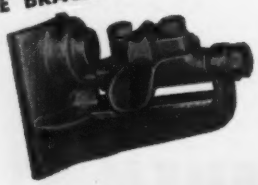
CLAMP-TOP GROUND-WIRE BRACKETS



-TOPS?

THE LAPP CLAMP IS EASIEST TO INSTALL

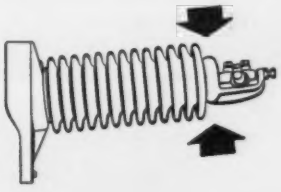
For original installation, insulator (or bracket) with clamp attached, is mounted to crossarm or pole. Keeper cap screws are loosened, and one removed. With keeper rotated out of position on remaining cap screw, conductor is dropped into place. Keeper is brought back to position, cap screw replaced, and both cap screws tightened. Cap screws have captive lock-washers so there is *only one loose part* per insulator throughout installation.

THE LAPP CLAMP IS EASIEST TO WORK WITH HOT-LINE TOOLS

No special tools required for insulator change-out. A trunnion cap screw is merely backed off, and conductor (with clamp attached) lifted out of position. The same clamp will slip into position in a replaced insulator and be secured by tightening trunnion cap screw. *No loose parts* throughout insulator change.

THE LAPP CLAMP-TOP IS MOST DEPENDABLE

A principle of Lapp Post design is the *external* attachment of hardware—*bases and caps.* This assures that the porcelain body be loaded only in large-area low-intensity compression. This design takes full advantage of porcelain's superior compression strength, and provides an assembly greatly more secure than one subject to the high-intensity tension loading introduced by internal pins and inserts.



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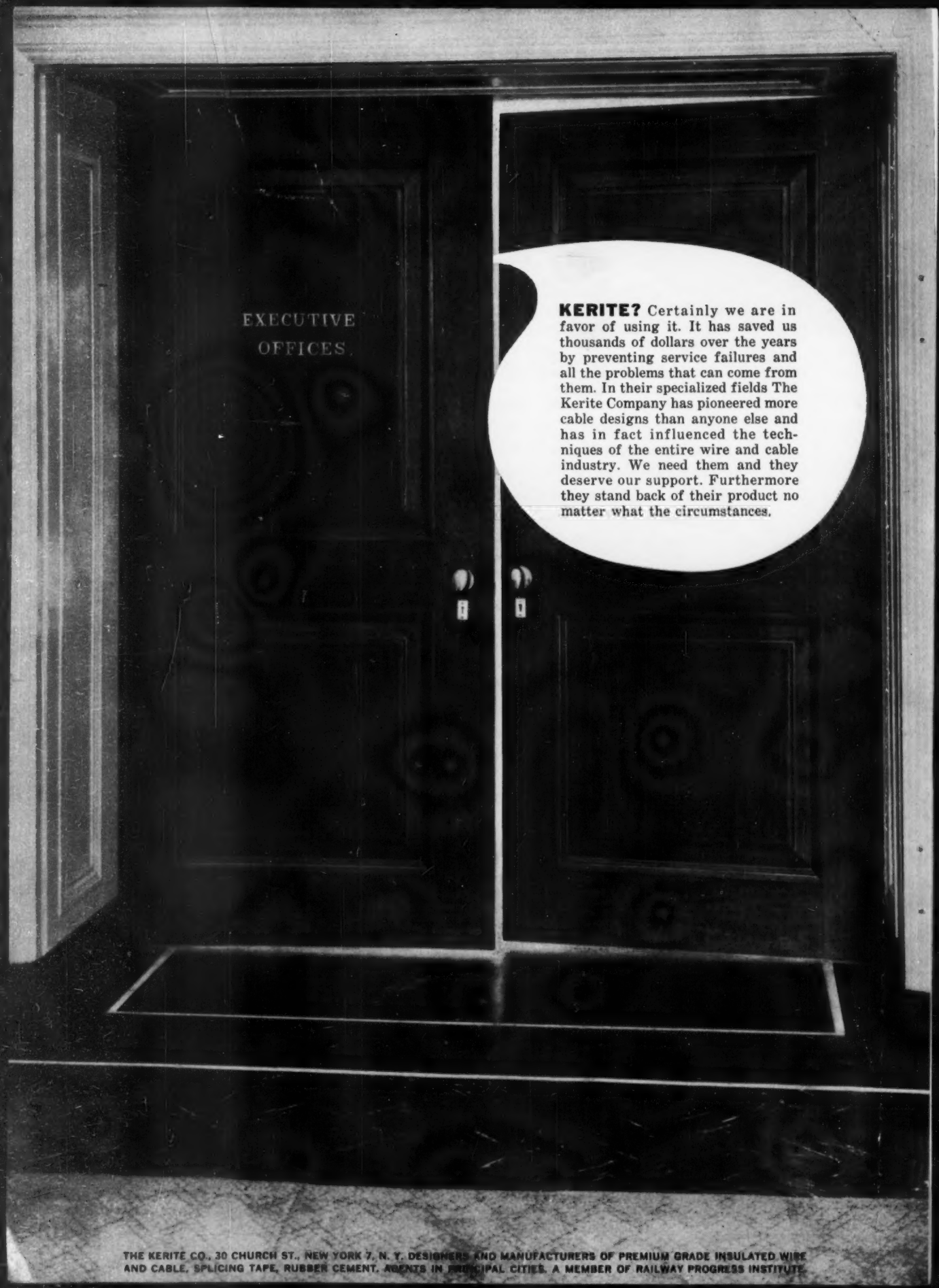
For new ideas on economical, efficient line and station construction read the new Lapp Catalog Eight. For your copy, write Lapp Insulator Co., Inc., Le Roy, N. Y.



KERITE? Certainly we are in favor of using it. It has saved us thousands of dollars over the years by preventing service failures and all the problems that can come from them. In their specialized fields The Kerite Company has pioneered more cable designs than anyone else and has in fact influenced the techniques of the entire wire and cable industry. We need them and they deserve our support. Furthermore they stand back of their product no matter what the circumstances.

THE KERITE CO., 30 CHURCH ST., NEW YORK 7, N. Y. DESIGNERS AND MANUFACTURERS OF PREMIUM GRADE INSULATED WIRE AND CABLE, SPLICING TAPE, RUBBER CEMENT. AGENTS IN PRINCIPAL CITIES. A MEMBER OF RAILWAY PROGRESS INSTITUTE

Editorial Comment

MAY 29, 1961

Electrical World, Teploenergetika Continue Interchange

This week (p 50), *Electrical World* presents another article on Russian electric power. This one is specially significant; it continues a developing interchange of information between US and USSR power authorities, using technical journals as a communications medium.

This exchange has been provided by *Electrical World* and by *Teploenergetika,* a Soviet power monthly magazine of rough equivalence. Philip Sporn, American Electric Power Co president, has authored the US articles.

For some time, Soviet and US power men have visited each others' territories, under their governments' policies of furthering information interchange. US teams have been sponsored by the Edison Electric Institute and the American Public Power Assn. The APPA team wasted their opportunity, concentrating instead on drawing political advantage by lifting certain information inappropriately out of the context of the broad Soviet program.

But sincere power men brought back a heretofore unavailable "feel" for the sweep and motivations of the Russian program, plus much specific information. Since short tours cannot delve deeply into technology, their chief accomplishment here was to establish focal points where more data and understanding are needed—especially if valid, meaningful comparisons are to be drawn.

Russian technical magazines are providing some of this type of data. But it is prudent to examine such information expertly to find whether it is accurate, or a mere smokescreen shrouding actuality.

Thus, when I. T. Novikov, USSR Minister of Power Stations, wrote a definitive article on the seven-year program in the May 1959 *Teploenergetika,* Philip Sporn approached it with this objective. In his Nov. 2, 1959, *Electrical World* article, Sporn checked the Novikov data for credibility. As a reference, he used his own expert opinion as to how Soviet power growth and technology logically might be expected to develop under Russian motivations and conditions.

Sporn here further defined areas of need for greater understanding. His article was accompanied by an open letter from *Electrical World,* inviting Novikov to comment on the points raised, "in the interest of broader interchange of technical information."

For a year, there was no answer. But the November 1960 *Teploenergetika* carried a direct reply by Novikov's chief engineer specialist. Some misunderstandings were cleared away. More questions, predictably, were raised. The Russians seemed to want to continue this mode of communications: ". . . the exchange of opinions . . . undertaken by *Electrical World* is certainly beneficial to the further strengthening of friendly relations . . ."

In this week's *Electrical World,* Sporn extends the interchange, and analyses other pertinent Soviet technical articles. His comments on the Russian reply state clearly where the Russian author digresses, evades or muddies the issue.

At the end, Sporn views further interchange with approval—and misgivings. We agree completely. The Russians should better organize their exchange articles to meet the prime objective of the exchange; should omit ideology; and should use highest-level authors for maximum credibility.

To the Soviet Power Station Ministry, and to *Teploenergetika's* editor, we say: Thank you for helping arrange this communications channel; let's keep it open. But let's do it with the full spirit of attempting to achieve complete understanding on a professional level.

- Interior Department task force raises engineering and economic questions
- Intertie between California and Pacific Northwest is still favored, however
- Group recommends substantial testing of certain features of the intertie

Drive for BPA-California Tie Slows

Some of the force seems to have been taken out of the Kennedy Administration's drive to push ahead with construction of a federal, 500-kv Bonneville-California intertie, according to implications in the preliminary report on the project by a five-man task force headed by Bonneville Administrator Charles Luce.

This report, requested by and submitted to Interior Secretary Stewart Udall:

(1) Asks for more time to complete planning for the line,

(2) Talks mostly of secondary energy to be moved on the line,

(3) Asks for full-scale tests of certain engineering features,

(4) Emphasizes the need for legal safeguards to protect the Pacific Northwest from loss of needed power which might be exported over the line to California,

(5) Suggests the need to tie in the southern leg of the big line with a California utility which can avail itself of the economics of steam displacement.

Policy Still Favors the Line

The project's apparent slow-down is limited, however, to the economic and engineering levels. At the policy-making and political level, the Kennedy Administration still talks glowingly of the line. "On the basis of this report," says Udall, "we believe that the proposed intertie holds great promise of mutual benefit to both areas . . ."

But political reality calls for a feasible project, and this is why the five-man task force has asked for more time. The big line won't be as easy to build and finance as had been earlier suggested.

The preliminary report, submitted by the Luce group, asks for more time—till Nov. 1—to complete its studies. Earlier, Udall had asked the group to report by May 1. Although Udall called only for a preliminary report in May, earliest estimates had been that this might give the group enough time for a concrete recommendation to be made to Udall so that authorizing legislation could be drafted and submitted to Congress.

The question of economic feasibility will require more study, says the report. Most of the surplus power to be moved over the intertie would be secondary energy, and this might not be sufficient to justify the huge line. The task force wants to study the line's value in relation to fossil fuel displacement, national defense needs, regional stream and load diversities. Also, a study is proposed into adding firm peaking generation capacity at existing Northwest hydro projects.

Full-scale testing of certain features of the line—a "substantial" length of line under actual operating conditions and high-voltage ac terminal facilities—is urged by the task force "as soon as possible." Although the report adds that line voltages up to 500 kv could be constructed immediately, testing is still needed. The task force also indicates uncertainty over whether the line should be built for direct or alternating current.

Legal protection for existing Bonneville markets is emphasized in the report. In fact, a press release issued by the Interior Department about the line talks about what the line won't do (take power required by the Pacific Northwest) even before it discusses the merits of what the line would do. This is a political necessity, because Pacific Northwest Congressmen must support the line, if it is to be built. And these Congressmen need political asurance that Bonneville-generated power will be available for all Northwest markets before California can claim any of it.

Authorizing legislation for the line, as discussed in the preliminary report, calls for a double preference clause for Bonneville power. All Northwest uses—firm, secondary, industrial and utility—would be met before power is made available for export south. In addition to this "regional priority," power contracts for exporting energy outside a region would require provisions for short notice of power reductions or termination, if required to meet foreseeable needs within the region.

The report estimates that between 2 billion kwhr and 25 billion kwhr of surplus power annually would be available for transmission to California, depending on stream flows. The 1966-67 surplus should be about 10 billion kwhr, based on the 1928-48 base study period, says the task force.

The need to tie in with a California utility is pointed up also in the report, because of the economics of coordinating steam and hydro operations. Both northern and southern California could take surplus peaking capacity off the line, the task force adds. And it also states that California steam plants could firm up Bonneville capacity during periods of low stream flow.

About 750 Mw of surplus hydro peaking capability would be available for export from the Northwest, under critical water conditions in 1966-67, the report says, while 1.4 million kw would be available in the same year during average conditions. This could be used for firm peaking energy if thermal generation supplies the basic energy.

Feasibility Is Doubted

In summary, what the report says between the lines is, "We think we can come up with a feasible line, but we don't know what it is now."

In addition to Luce, members of the task force are Bernard Goldhammer, Bonneville commercial operations officer; Morgan Dubrow, Washington, D. C., Bonneville manager; Assistant Interior Secretary Kenneth Holum; Hugh Dugan, Sacramento regional Reclamation director, and Milton Chase, engineering consultant to Holum. In addition to these men, other consultants were contacted.

Resource Group Is Political Problem

Kennedy Administration and Congress are at odds over placement of the proposed Natural Resources Advisory Council as appropriation is studied

The fight for a permanent, policy-making, Natural Resources Advisory Council at the White House shifts soon from the Senate Interior Committee to the Senate and to the House Appropriations Committee. That's where an alternate plan, proposed by President Kennedy, will be considered for inclusion in the fiscal 1962 budget.

An independent White House body was proposed earlier in two similar bills in the Senate, one by Sen Clair Engle (D-Calif.) and 30 other Senators, and the other by Sens Gale McGee and Joe Hickey (Wyoming Democrats). Hearings were held on these bills in late April (EW, April 24, p 43).

Kennedy has come up with an alternate plan, however, much to the dislike of many Senate Democrats. This calls for added resources planning activities under the Budget Bureau and Council of Economic Advisors.

Score Kennedy Plan

Engle and McGee pointed to numerous Democratic campaign statements last fall that called for creation of the independent advisory group. They also hit at the apparent Kennedy plan to strengthen the position of the Budget Bureau over cabinet-level planning.

Kennedy Administration officials asked the Senate committee in April to hold off action on its proposed legislation until the President could complete his alternate plan for resources advisors. That plan, along with a budget estimate, was given last week to the House Appropriations Committee for study. It asks an additional $190,000 specifically for hiring ten resources and public works advisors for the Budget Bureau, plus another $200,000 to add coordinating services to the Council of Economics Advisors for three fields: public works, natural resources and international economics. Washington observers estimate the latter sum would provide about four people in the area of natural resources—a total of 14 from both categories.

Actually, Kennedy's plan would result in a net reduction of ten persons in resources planning, since he has abolished the Public Works and Resources Planning Coordination Office, headed by Gen John Bragdon under former President Eisenhower. That group had employed 24 persons under special White House funds.

Principal obstacle to the Kennedy plan lies in Congressional objections to strengthening the role of the Budget Bureau over departmental activities. Proponents of the Engle and McGee bills probably will sit back and see how the Administration's proposal fares in the Appropriations Committee. The Senate Interior Committee has completed hearings on the legislation, and may take up the matter in executive session later this year, depending on Congressional attitude toward the Kennedy proposal.

AEC Clears Yankee, Dresden

Safety operating procedures of Commonwealth Edison's 180-Mw Dresden nuclear power station and Yankee Atomic's 110-Mw pressurized water power reactor have been reviewed and cleared by the Atomic Energy Commission.

A total of 60 investor-owned and 71 government-owned reactor facilities have had their operating routines surveyed by AEC following the SL-1 nuclear explosion in Idaho. Both the Dresden and Yankee power plants—as the only two large investor-owned atomic power facilities—are following needed safety precautions during operation and maintenance periods, AEC officials say.

AEC says further that survey results show measured maximum reactivity values of all 131 reactors in the review are in agreement with their safety hazards reports. These hazards reports are the basis upon which construction permits and licenses to operate are awarded to reactor operators by AEC.

The SL-1 survey's principal conclusion is that there is "no immediate danger" of an accidental nuclear excursion in any reactor now in use.

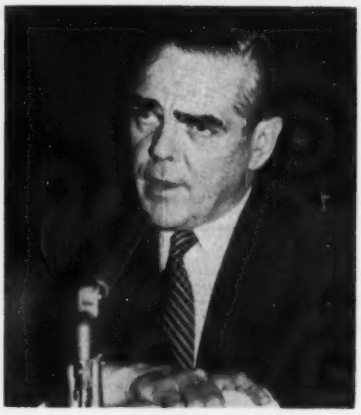
EEI Opposes Hanford A-Plant

Opposition to the addition of generating facilities to the Hanford New Production Reactor (NPR) has been registered by the Edison Electric Institute.

In a letter to the Joint Committee on Atomic Energy, EEI President Sherman R. Knapp stated May 16 that as "far as power production is concerned, the Hanford reactor represents retrogression rather than progress (and) cannot possibly be justified on the basis of making a contribution to nuclear power technology. . . . The uneconomical use of the low-temperature, low-pressure steam of the NPR will not add to our prestige in the international scientific community, nor will it advance nuclear technology."

As an alternative, EEI suggested "it would be more profitable from the standpoint of the nation's progress in nuclear power development if money were spent on more basic projects . . ." This view coincides with the results of a poll by Rep Craig Hosmer (EW, May 22, p 64).

Cresap Defends Identical Bids Before Antitrust Committee



CRESAP

An unyielding defense of identical bids and of the way he has prepared his company for future antitrust compliance characterized the appearance of Mark W. Cresap Jr before the Senate Antitrust & Monopoly Subcommittee. The Westinghouse Electric Corp president was on the subcommittee witness stand a total of over three and a half hours on May 17 and 18.

Testimony from General Electric Chairman Ralph Cordiner was postponed because of conflicting Senate schedules.

Before a sparsely attended hearing, Cresap outlined in a prepared statement to the subcommittee the steps his company has taken to assure future antitrust laws compliance. Highlight of these steps is the naming of a "Board of Advice," comprised of the deans of the Harvard and Yale law schools, a University of Michigan Law School professor, and an economist of the Brookings Institution. These men, Cresap said, "will review our procedures and . . . counsel us on the steps we have taken, and on those which might be indicated for the future."

But Cresap was questioned sharply on the fact that he did not personally interrogate employees involved in the price fixing to get a better feel of the situation. Cresap replied that there was "no dearth of information" and that his policy had been "not to rake over the past but to make sure about the future."

Under repeated questioning from Sen Estes Kefauver (D-Tenn.), the subcommittee chairman, Cresap reiterated that he had "no reason to suspect that there was any artificial fixing of prices" prior to the disclosure of the Philadelphia cases, since the company's profits were low.

On identical bids, which the Senator noted are continuing in some phases of the electrical industry, Cresap said he had satisfied himself that these were not the result of collusion, but of competition in standard, off-the-shelf items. Sen Kefauver asked Cresap what difference there was to the public between identical catalog prices collusively arrived at and those arrived at through catalog price sheets circulating among competitors. The difference, Cresap replied, was that the latter catalog prices are the result of competitive forces.

The Westinghouse head explained that his company's policy was to price "independently" and "to meet the lowest price of competitors." If offered something less than book price, he noted, the company might deviate from the book, depending on how much it wanted the business. But this, as well as deviating from book on sealed-bid business, "would inevitably change catalog prices," Cresap explained.

Cresap told the subcommittee the antitrust laws are "good tough laws" which are "difficult and complex," but that following them "can be done." He declined to offer any suggestions as to how the laws could be improved to make his job of assuring future Westinghouse compliance more easy to do. But he answered "definitely not" when asked whether he thought the laws should be weakened.

At another point in the testimony, Cresap said the decision not to discipline employees involved in the cases was the "hardest." Kefauver indicated he approved of Cresap's handling of the matter.

Electric Bus Shuttles NSP Employees

All-electric bus is being used by Northern States Power Co to shuttle employees between its service center and downtown Minneapolis headquarters. The 13-passenger vehicle, powered by 14 three-cell, 6-v batteries, makes the two-mile round-trip every half-hour during normal business hours. Total daily mileage possible ranges between 50-55 miles; top speed is 20 mph. Cost of operation is about a penny a mile; approximate cost of the bus, including batteries, is $9,000.

Fryingpan Hit for Hidden Subsidy

Authorization legislation for the proposed Fryingpan-Arkansas project, Colo., has been hit by criticism in public hearings by the House Interior Subcommittee on Reclamation.

Specific criticism of the project was absent although several Congressmen hit at general principles and actions of the Bureau of Reclamation.

Legislation has a fair chance of enactment this year, although similar authorizing bills have failed to win Congressional approval on four previous attempts.

Rep James Haley (D-Fla.) hit at "constant misleading" of the public by the Bureau of Reclamation, in failing to publicize the difference in interest rates paid by the US Treasury for its money, and the interest rates used to repay federal investment in reclamation projects: "You ought to tell Congress," he told Reclamation witnesses, "that there's a hidden subsidy in these projects—almost equal to the cost of the project at 2% over 50 years —that's not being returned to the Treasury or to the people."

Rep Odin Langen (R-Minn.) criticized the spending of federal funds to irrigate and stimulate crops in Colorado while federal funds are being used in his state, and others, to take identical crops out of production.

Rep D. S. Saund (D-Calif.) criticized the Bureau for planning upper basin projects, like Fryingpan, without making studies of the effect on Colorado River water quality and quantity in the lower basin states.

Old Objections Missing

Generally, however, the bill was discussed without specific objections. Most of the previous differences in opinion, between East and West Slope spokesmen, and between Reclamation leaders, appeared to be gone.

Rep Edgar Chenoweth (R-Colo.), long the bill's staunch sponsor, said "Colorado is united on this project" and that "water groups of both the East and West Slopes (of the Continental Divide) were able to get together on details of this project, and agreed on a bill."

The project would cost $169,905,000. It would have a power capacity of 123.9 Mw and would provide supplemental irrigation water for 280,000 acres in the Arkansas River basin. Reudi reservoir, in the Fryingpan Valley on the West Slope, would impound 100,000 acre-ft of water, of which 69,100 acre-ft would be diverted by tunnel to the Eastern Slope near Leadville, Colo.

Chenoweth emphasized that the project has been recommended by Presidents Truman, Eisenhower and Kennedy.

The present bill calls for the entire project to be self-supporting. Earlier bills had proposed charging off a portion of the West Slope facilities to the Colorado River Storage Act.

The Budget Bureau also has approved the present bills (HR-2206 and S-284) with two qualifications: **(1)** The Bureau presently is reevaluating appraisal standards for water resources projects, and the Interior Department should re-allocate Fryingpan's costs on the Bureau's new standards, due to be completed in June; **(2)** The Justice Department is studying legal implications of the proposed five-man Fryingpan Operating Commission (three Colorado, two federal officials), and the Bureau plans to make a comment on this when the Justice report is completed.

Utilities and Co-ops in Favor

Supporting the project are Southern Colorado Power Co, Public Service Co of Colorado, Arkansas Valley G&T Cooperative and the National Rural Electric Cooperative Assn.

Consolidated Edison Shareholders Meet

The company's purchase of two 177-Mva power transformers from a foreign manufacturer should be a salutary reminder to the home industry to keep prices competitive, stockholders of the Consolidated Edison Co of New York were told this month at their annual meeting. The purchase was made from Ferranti Electric Co of Great Britain.

Furthermore, management continues with the "monumental task" of determining whether Con Edison has sustained any damages from dealings with the 29 electrical equipment manufacturers involved in recent price-fixing convictions, said Harland C. Forbes, chairman.

Forbes presided at the frequently stormy meeting at which stockholders repeated their demand of a year ago for rights identical with those of American Telephone & Telegraph Co shareholders. Utterances from the floor urged that stockholders be enabled to subscribe for every kind of security offered by Con Edison.

Pointing out that market conditions often made private placement more advantageous to the company, Forbes denied that stockholders have any presumptive rights to subscribe to preferred issues. A resolution that such rights be granted was defeated in the subsequent balloting.

Another ballot authorized the company to transact operations in all counties of New York State. Hitherto, it has been limited to New York, Queens, Kings, Richmond, the Bronx, Westchester, Nassau, and Suffolk Counties. Discussing the measure, Forbes was constrained to deny the likelihood of any rumored mergers with neighboring utilities.

The meeting drew a record 830 stockholders, to whom Forbes announced a gain of about $6 million in net income for the year ended March 31. Profit for the year, he said, was $73,200,000 against $67,200,000.

For the past three months, it was $24,900,000 against $23,600,000 in the first quarter of 1960. He noted, however, that share earnings dropped to $3.78 from $3.81 for the 12 months and to $1.35 from $1.39 for the quarter.

High Interest Shown in Rural Area

A political expedient has turned into an entirely new opportunity for revitalizing depressed rural areas with federal government assistance.

Sen Paul Douglas (D-Ill.), author of S-1, which is now known as Public Law 87-27, or the Area Development Act, very candidly told nearly 800 electric cooperative managers and directors that the rural areas portion of the bill was added belatedly in order to get votes enough to gain passage of the bill.

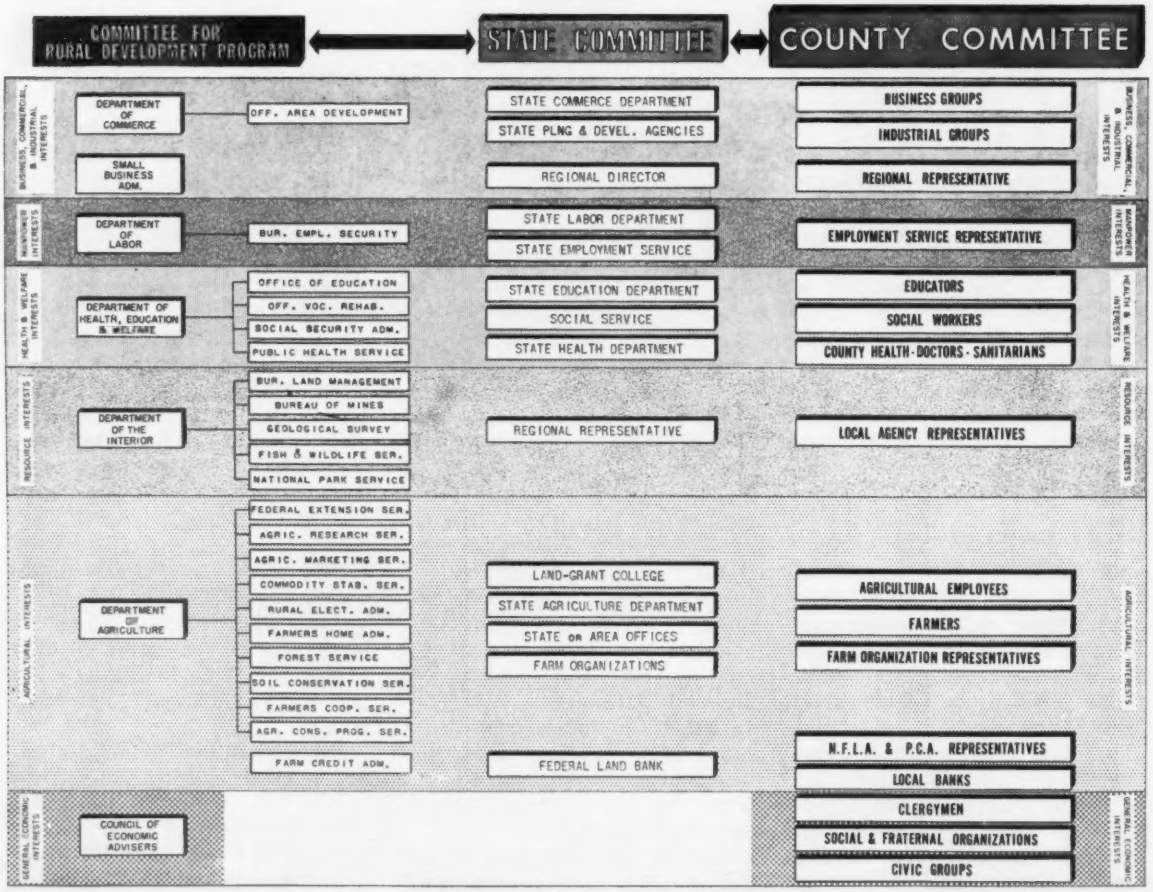
But this political "accident" is being taken quite seriously by the National Rural Electric Cooperative Assn and the US Department of Agriculture. Evidence of how seriously it is regarded was obvious at a Rural Area Development Conference, sponsored by NRECA, in Washington May 14-15. Virtually everyone interested, from the Secretary of Agriculture on down, was on hand to explain the significance of the bill and the role of rural electric cooperatives in its implementation.

Nearly 800 delegates appeared to be taking it seriously, too. They attended sessions faithfully, listened attentively, and occasionally expressed some discontent at the lack of specific information as to what they can *do*. The program is so new that officials cannot even say specifically at this point what will be required to qualify as depressed areas, and this was somewhat frustrating to men eager to start moving on the program.

The Area Development Act (ADA) provides about $394 million for the program. About $100 million of this sum is available to commercial and industrial enterprises in depressed rural areas on a loan basis. Virtually everyone called this a "nominal" amount and indicated it is only a "pilot" program, or beginning, with more to come if the initial program is successful. There was equal unanimity in expressing that the funds are in no sense a handout; that qualification would be stringent; that it would take a great deal of local initiative and community effort before the enterprises can even apply for the loans.

In no case can the government finance more than 65% of an enterprise. Remaining funds must come

RURAL DEVELOPMENT COMMITTEES



ORGANIZATION CHART handed out at the conference shows the complexity of the program envisioned by planners

from local or state agencies and private sources. Federal money will be loaned with an interest rate based on the current average yield of Treasury marketable obligations of comparable maturity, plus half of 1% for overhead. At the present, this would be at a rate of about 4⅜%, for example.

According to REA Administrator Norman Clapp, and other speakers, any industries financed in rural areas, such as food processing plants, alfalfa dryers, woodworking plants, etc., will not be "pirated" from other areas. Clapp said:

"There is also a danger that this program can degenerate into a kind of game of industrial musical chairs. Merely moving a plant from one part of the country to another will not solve our problems. It will raise neither our national income nor our national product. The federal government cannot participate in programs involving the pirating of industry from one place to another."

Although the NRECA program was naturally devoted to rural areas only, the field is open to all local interests. Secretary of Agriculture Orville Freeman told an *Electrical World* editor that investor-owned utilities "certainly are" included among potential area development leaders. In this case, the whole field of area development, beyond the limitation of rural areas, is open. Of the $300 million available for financing, $200 million is for industrial and commercial enterprises, and $100 million is for public facilities. In addition, $94 million is authorized to be appropriated by Congress for job retraining, research, etc., and will be grants rather than loans.

William L. Batt Jr, who will head the new Area Development Administration, told delegates:

"The basic process by which the Act will operate places great responsibility on local initiative. After a local community is designated as a redevelopment area, local leaders must develop an over-all economic development plan for the area which must be approved by the state in which the area is located and which must be submitted to the ADA. When this over-all progam is approved by the administrator, the local community will develop industrial and commercial projects which are consistant with the over-all plan, and secure endorsement by the state before submittal to the ADA for approval."

Batt itemized the following things that can be done now:

- Establish or support an active development organization that is authorized to represent the entire redevelopment area;
- Establish working relations with the state economic development agency;
- Develop an over-all economic development program, and get it approved by the state;
- Determine the occupational training and retraining needs of the area;
- Raise the necessary local and private capital.

Batt expressed hope that the first loan can be processed within the next two months.

For many attending the conference the federal financial assistance was about the only new element. Several case histories that were related were evidence that co-ops in some depressed areas have been carrying on extensive area development programs for a long time. Agriculture Department personnel reminded delegates they have been working along these lines for years, too.

NRECA was publicly given credit, however, for stimulating new and general interest in the program —and even for helping the Area Development Act through Congress. Sen Douglas said NRECA endorsement of the bill at its annual meeting in Dallas could well have been the turning point for the measure, particularly in gaining support from Southerners.

Aside from the new opportunities provided by ADA, co-ops also have other means of improving conditions in their areas. In a recent interview, Norman Clapp told *Electrical World's* Burkey Musselman that REA Section 5 loans can be made to cooperatives for relending to industries for the purchase of power consuming machinery (EW, May 22, p 60).

It is possible, too, that REA will be designated as the distributing agency for the rural areas loan funds. In this regard, Clapp said:

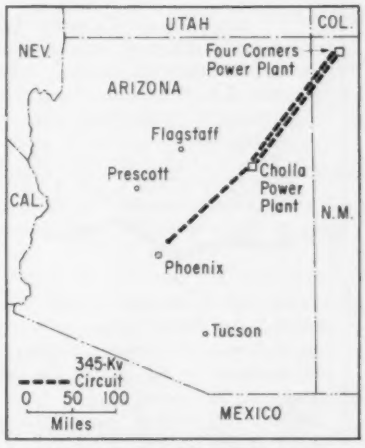
"We'd make loans to anyone in rural areas who qualified under the new program, not just to our electric or telephone borrowers."

Contracts Let for Four Corners Lines

Howard P. Foley Co and Telco, Inc, both of Salt Lake City, jointly will construct the 345-kv transmission line from Arizona Public Service Co's Four Corners Power Plant in northwestern New Mexico to Phoenix, 300 miles away. The low bid price, not including terminal equipment, was $17,481,077, or $38,400 per circuit mile.

Construction is expected to be under way by the end of the month, and the project is scheduled for completion by Feb. 1, 1963. However, the contractors have made known their intention of completing the job in advance of that date.

One of the longest 345-kv lines ever constructed in the US, it will cross some of the most rugged terrain in Arizona. From Four Corners two steel tower lines will be constructed to the APS Cholla Plant now being built near Joseph City, Ariz. A single steel tower line will run south from Cholla over the Mogollon River to Pinnacle Peak just north of Phoenix. Because of the double line from Four Corners to Cholla, there is a total of about 450 circuit miles of line.



CONSTRUCTION STARTS this month

Soviet Shift to Big HP Steam Units

Russian power spokesmen give new details of plans for large supercritical plants and units. Show power system plans developing on expected lines. Close accurate comparison with US practice found difficult

PHILIP SPORN, President, American Electric Power Co

A number of authentic papers by responsible Russian power authorities are now available[1,2,3,4] which throw new light on the Russian seven-year power program and permit reappraisal of its scope and technical significance.

Some of these data are conflicting. But on the whole they present a pretty fair picture of progress in the USSR electric power expansion program in the last 12 months; the current projections; the status of power production, technology, and electrification in the USSR; and the basic or motivating philosophy behind current intensive development of the Russian program of power expansion. They also throw some interesting additional light on the question of leadership in electric power development and suggest the basis for the exchange of knowledge and information between the USSR and the United States.

In this article I shall attempt to cover each of these items, and in that order.

Annual energy output for 1958 and 1959, for the remaining six years of the current seven-year program, and for the projected program to 1980, are given below together with US figures for comparison:

Annual Kwhr Output in Billions of Kwhr

	USSR	USA	
		Utility	Total
1958	238	646	725
1959	264	710	795
1960	—	753	841
1965	520	1,100	1,200
1970	900	1,600	1,750
1975	1,500	2,200	2,375
1980	2,300	3,000	3,200

US figures are for the continental US only. The first column excludes all non-utility generation; the second includes non-utility generation, except isolated plants in

В ЧЕМ НЕПРАВ ФИЛИПП СПОРН?

Инж. А. П. РОЖДЕСТВЕНСКИЙ

Главный специалист Министерства строительства электростанций СССР

В журнале «Electrical World» в конце 1959 г. была помещена статья видного американского энергетика, президента «American Electric Power C°» Филиппа Спорна под заглавием «Что означает программа энергетического строительства России». Автор поставил своей задачей дать в статье критический анализ и сопоставление энергетики США и СССР на основании данных о программе энергетического строительства в Советском С[illegible] в период с 1959 по 1965 г. [illegible]

Темпы развития энергетики СССР были все время выше и останутся более высокими, чем в США.

По нашим расчетным данным, основанным на материалах перспективного развития народного хозяйства СССР и непрерывно возрастающего потребления электроэнергии на коммунально-бытовые нужды населения, производство электроэнергии за пределами 1965 г. еще более увеличится, [illegible] как мы полагаем, составит в 1970 г. [illegible]

"An article entitled 'What Russian Power Expansion Means," by Philip Sporn, a prominent American power specialist and the president of the American Electric Power Co, appeared in the journal Electrical World late in 1959 [November 2; updated April 18, 1960]. In it the author undertook a critical analysis and comparison of power generation in the US and USSR. . . ."

Thus starts the article "In What Way is Philip Sporn Wrong–" that appeared, above, in the Russian engineering magazine Teploenergetika, No. 10, November 1960 under the authorship of A. P. Rozhdestvenski, Engineer Chief Specialist of the USSR Ministry of Power Stations. In it the Soviet power Ministry answered Electrical World's editorial open letter of November 2, 1960, inviting a reply.

Now, on these pages, Electrical World presents the third commentary on Russian power progress by Sporn.

In it he answers Rozhdestvenski's article and comments on two articles by other Russian power experts; "Some Problems of the Complete Electrification of the USSR," by M. Vilenskiy, "Voprosy Ekonomiki" No. 8 August 1960 and "From the GEORLO Plan to the Complete Electrification of the Country," by I. T. Novikov, Teploenergetika, No. 12, December 1960.

For those interested in following the details of these three Russian articles to which Sporn replies Electrical World offers English translations at 25 cents each. Requests should be addressed to: Foreign Editor, Electrical World, 330 W 42nd Street, New York 36, New York.

Holds No Surprises

institutions, and the like. Thus figures in the second column are properly comparable to the USSR data.

As pointed out earlier[5] the USSR projections to 1965 are ambitious but solid projections. Those made at the beginning of the seven-year program for the first and second years have quite likely been achieved. There is clear indication that projections for later years may also be achieved. Nevertheless, A. P. Rozhdestvenski[2] has questioned an opinion expressed by me[6] regarding the likely tapering off of this rate of progress. It is interesting to note that the increase shown here for 1958-1959 is 10.9%. This is a decline from previous figures of energy use and energy output. Even more interesting is the 1975-1980 projection which represents a compound rate of growth of 8.9%. Thus there is no reason, in spite of the undoubted high competence of Rozhdestvenski, to change my judgment that in time the Russian figure of annual energy increase will decline to a value resembling the current US figure and settle down at a figure of doubling approximately every ten years.

The figures on capacity increase are even more interesting. Data for 1958 and 1959 and figures for 1965, 1970, 1975, and 1980 are based upon published energy figures and known load factors, including some assumed improvements. US figures are shown for comparison.

Installed Generating Capacity, Millions of Kw

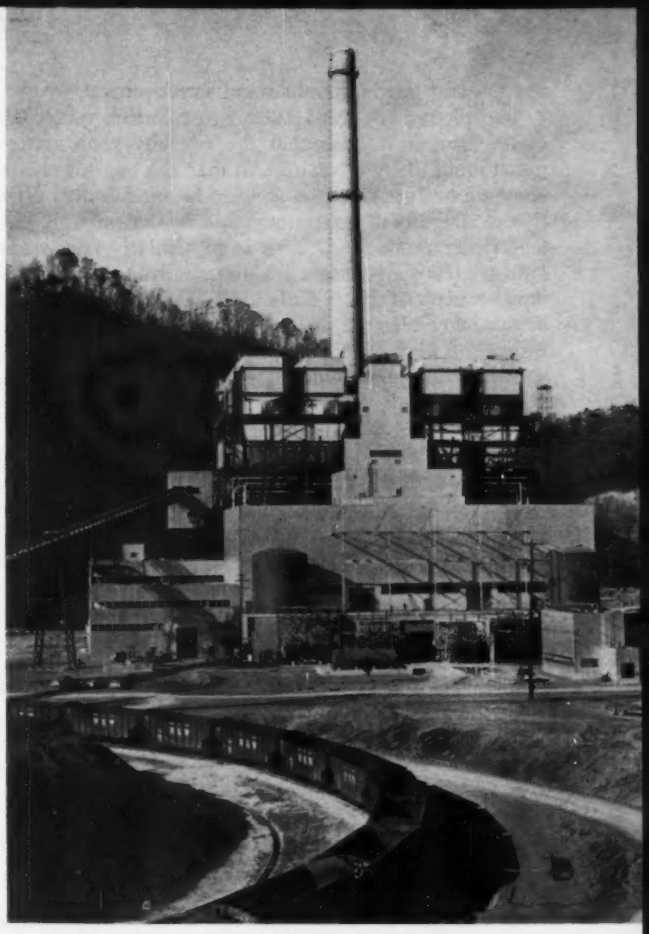
	USSR	USA	
		Utility	Total
1958	53.4	149	167
1959	58.9	163	181
1960	—	175	193
1965	114	240	265
1970	196	325	355
1975	323	450	485
1980	490	600	640

Capacity figures for the US shown above are comparable to the energy figures in the previous table.

There is nothing new or startling in the Russian figures. The 1980 figure of close to 500 million kilowatts will, if attained, represent a major achievement. Yet, there can be no doubt that US capacity will exceed Russia's by a substantial margin.

The principal direction of Russia's power generation development during 1959-1965 remains unaltered. Preferential construction of thermal stations burning cheap coal, natural gas, and residual oil[4] will continue. The emphasis will be on large stations using large units. There is even talk of 2.4 million kw thermal stations with large (300 Mw?) units. But actual information on the location, size of units, pressures and temperatures, and date for beginning the first construction of such large plants is conspicuously meager.

But the picture of the Russian seven-year program is coming ever more sharply into focus. Capacity in the seven-year period will be slightly more than doubled. Energy in the same period will increase slightly more, with a small improvement in load factor. Costs are to



HIGH PERFORMANCE PLANTS like Clinch River Station with annual heat rate of 8,975 Btu for 1960 back US claim to leadership over Russia in steam technology

be improved, but no real information is given as to actual costs. According to Vilenskiy[1], the cost of a kilowatt of capacity in small plants (with a 1955-57 average capacity of 33 kw) is from 4,000 to 6,000 rubles and this is from six to eight times as much as in the case of large plants. Considering the small size of such plants these ratios are not excessive. If they are accepted, then the cost of a large plant might be of the order of 667 to 750 rubles per kilowatt. If for this purpose, the effective rate of exchange prevailing in August is assumed to cover a range from 4 to 10 rubles per dollar, then large plant costs are obtained at values of from $83 to $187 per kw. These figures, speculative at best, are not low and the resulting energy costs are not low. But perhaps with the introduction of better methods of construction, more efficient generating units, and more economical methods of operating, these costs will come down.

That the prevailing energy costs are excessive by modern American standards is certainly borne out by the Vilenskiy[1] data giving the apparent average production cost of energy in the USSR in 1958 as 7.98 kopeks per kwhr. On the basis of a 4:1 rate of exchange the unit cost would be 2.0¢ per kwhr, on the basis of 8:1 the unit cost would be 10 mills per kwhr, and on the basis of 10:1, 8 mills per kwhr.

In any of the above cases these cost figures are high. They exceed total costs, including capital charges, in

the US and they certainly stand improvement.

The picture for 1965-1980 is, of course, much less clear. But it is clear that the capacity projection is much more likely of realization than the one for energy generation. It is essential to keep in mind at this point that availability of generating capacity does not guarantee energy production. This is particularly true as an industrial society reaches a more advanced stage of development. Then it finds itself at a point where the determining element in energy generation is the existence of utilization equipment on the line, ready to absorb energy that will be generated on call by the utilization loads. When such utilization equipment is not present, generation simply does not take place.

It is gratifying to find this basic principle recognized by Vilenskiy. He says[1] "the fact that the electrification of technology is lagging behind the electrification of power processes is due to the inadequate development of power production." Vilenskiy also states[1]: "The USSR has made substantial achievements in the electrification of industrial production. But we are still considerably behind the United States where the relative share of such power-consuming industries as aluminum, magnesium, chemical and atomic in the over-all power picture of the industry was 53.5% in 1956."

Eventually this limiting factor to the use of electric energy will disappear in Russia as it has disappeared in the United States. With its disappearance, electric energy growth will be determined by two main factors:

1. The rate at which utilization devices can be developed among the civilian, including the agricultural, population.

2. The rate at which electric utilization equipment can be developed among the industrial population, including defense industry.

USSR Production, Technology, and Electrification

A discussion of the relative status of power production and electrification in the USSR in comparison with the US would not only be interesting but could be most instructive. But such discussion is frequently made difficult, if not impossible, by the confusion of technological questions with technical ideological dogma. Even if one passes over, the assertions by USSR technologists of principles based on nothing more solid than dogma, how can one develop a fruitful technical discussion, even with such a distinguished technician as the Minister of Power Station Construction of the USSR, in the face of assertions of priorities and claims for outstanding achievements which simply do not stand up to analysis?

For example, the claim is made[4] that their boilers in the early 1930's used pressures of 34 atmospheres and were operating "at rather high, for those times, steam parameters" cannot be taken seriously when the first Philo unit of Ohio Power Co began operating at a pressure well in excess of that in 1924, and the Deepwater Plant of Atlantic City Electric Co and the United Gas Improvement Co began operating at a pressure of 1,250 psi (85 atmospheres) in 1930.

The same paper claims that USSR electric stations are "permeated with the most modern technology." The proof offered is that high-voltage transmission lines are equipped with automatic reclosing apparatus.

This is perhaps not inaccurate, but it omits the fact that this technology was developed some 25 years earlier in the US on the author's system.

In the field of transmission, the same author[4] claims that the "first in the world 400-kv transmission lines from Volga Hydroelectric Station to Moscow were put in use in 1956" is perhaps literally true enough. But 380-kv lines were put into service in Sweden well before then, and in the US, again on the author's system, 345-kv lines operating at voltages up to 362-kv were put into service in 1953. The essential difference in technology between 362 and 400 kv is so small as to be almost negligible.

Nevertheless if one somehow disregards these overblown claims and gets down to more solid ground, there are a very considerable number of interesting comparisons that can be made with regard to the technologies of the two countries.

US vs USSR Boiler and Turbine Technology

To start with boilers: When Mr. Novikov states[4] that "The Tagaurog plant together with Central Scientific Research Institute for Boilers and Turbines designed, and in 1952 built, the first commercial drum boiler for 200 tons per hour with steam parameters of 185 absolute atmospheres and 500C" and that this was installed in 1953, he has reference, obviously, only to the first commercial unit in Russia. This must be so since I am sure it is well known, even in Russia, that in the US Twin Branch No. 3 went into service in 1941 at a pressure of 180 atmospheres drum pressure, at a temperature of over 500C, and with a rating of 260 tons per hour. And since then the Breed and Sporn No. 5 boilers have been placed into commercial operation at a pressure of some 250 atmospheres, at a temperature of 565C, with reheat and second reheat temperatures at the same level. These are supercritical units producing a net capacity available to feeders of 500,000 kw.[7]

As to generating units (turbo-generators): It is claimed by Novikov[4] that "design has been completed and production begun on a 300,000-kw steam turbine and work is proceeding on the creation of a superpowerful 800,000-kw turbine." On the system of the author, two 500,000-kw steam-electric turbines, 3,500 psi, 1,050F, and double reheat at the same temperature are in operation, as stated above. Moreover a turbine expected to have an actual capability of close to 625,000 kw, again at 3,500 psi, double reheat, and temperatures of 1,000F, 1,025F, and 1,050F, will be in service by 1964. Elsewhere in the American power economy two steam-electric turbines, each with a net maximum capability of 950,000 kw, also 3,500 psi, have been firmly ordered, and will in planned course go into service, the first in 1965.

Size of Generating Plants

The Minister of Power Plant Construction claims[4] that the design of a 2.4-million-kw thermal station has been worked out and construction plans revised so they can be prefabricated. He also claims that the first unit of this station "is to be operational 26-28 months after the start of construction while full capacity operation is scheduled in 48 months." Nowhere, however, is the statement made as to when construction of the first unit has been or will be started, when that

Table I—19 Steam Power Plants of 1 Million Kw or More Now Operating or Being Built in US

Station	Company	Capacity in Service or Planned (Mw)	Remarks
Philip Sporn	American Electric Power System	1,060	In service
Tanners Creek	" " " "	1,095	Unit No. 4—580 Mw under construction—in service 1964
Kyger Creek	Ohio Valley Electric Corp	1,086	In service
Clifty Creek	" " " "	1,304	" "
Kingston	Tennessee Valley Authority	1,440	" "
Shawnee	" " "	1,350	" "
Johnsonville	" " "	1,275	" "
Gallatin	" " "	1,050	" "
Widows Creek	" " "	1,675	Unit No. 7—500 Mw under construction—in service 1961 Unit No. 8—500 Mw " " " " 1963
Colbert	" " "	1,220	Unit No. 5—500 Mw " " " " 1962
Paradise	" " "	1,300	Unit No. 2—650 Mw " " " " 1962 Unit No. 1—650 Mw " " " " 1963
Huntley	Niagara Mohawk Power Co	1,090	In Service
Astoria	Consolidated Edison Co of N. Y.	1,392	Unit No. 4—360 Mw under construction—in service 1961 Unit No. 5—360 Mw " " " " 1962
St. Clair	Detroit Edison Co	1,275	Unit No. 6—325 Mw " " " " 1961
Pittsburg	Pacific Gas & Electric Co	1,236	Unit No. 6—320 Mw " " " " 1961
Will County	Commonwealth Edison Co	1,107	Unit No. 4—510 Mw " " " " 1963
Waukegon	" " "	1,042	Unit No. 8—305 Mw " " " " 1962
Joppa	Electric Energy, Inc	1,041	In service
Oak Creek	Wisconsin Electric Power Co	1,025	Unit No. 6—275 Mw under construction—in service 1961

unit will be followed by the next unit, or when the station will reach a capacity of 2.4 million kw.

Against this is a matter of record that there are now operating or in process of being constructed in the United States 19 thermal electric stations, each with a capacity of 1 million kw or more. The largest of these has a capability of 1,675,000 kw. The accompanying detailed tabulation, Table 1, shows the name of station, the name of the company, the capacity in actual service or being added, with the number of the unit under construction and the date of completion clearly indicated.

Furthermore, the recent placing of definite orders for large units by TVA and the AEP System (two units of 950-Mw capability by the former; one unit of some 625-Mw capability by the latter) definitely gives a solid base for either the 2.5-million-kw plant or the 3.8-million-kw plant. The smaller plant would consist of four units of 625 Mw rating each, and the larger also of four units of 950 Mw rating each. Indeed if economics of location—including the economics of concentration of a block of thermal electric capacity above a certain top limit—and the economics of load distribution are all properly coordinated and favorable there is no real reason why a plant of five 950-Mw units, giving a capacity of 4,750,000 kw, cannot be designed and successfully built with complete confidence in the US economy, once the first unit has been built, placed on the line, and has a brief period of operation.

Plant Volumetric and Thermal Efficiencies

Novikov points out[4] that designs of the last two years, as a result of "novel grouping of equipment and the increase in capacity of individual units, as well as of whole thermal-electric stations, made it possible to reduce construction cubage from 0.69 cubic meter per installed kilowatt capacity to 0.45 cubic meter and to decrease total weight of all building construction by 35-40%."

This certainly is no striking achievement. As has been pointed out in a relatively recent full analysis of the characteristics and the performance of the Breed Plant[7], this station is enclosed in a volume of 13 cu ft per kw. This cubage is 18% less than the recent achievement of 0.45 cubic meters (15.9 cu ft) so

proudly presented by Mr. Novikov.

Finally, in one other phase of generating plant performance, namely thermal efficiency or efficiency of conversion, there is a good deal of vague discussion about thermal performance of the Russian power stations to come. In a previous review of Russian performance in an article in Electrical World[6] we pointed out that the projected performance of the advanced supercritical units of 300 and 600 Mw rating in the Russian program average 311 grams of fuel per kwhr, probably representing a thermal performance of 8,650 Btu per kwhr. This is a thermal efficiency of very close to 39.5%. Test data on the Breed Unit[7], on the other hand, gave a performance of 8,376 Btu per kwhr, or a thermal efficiency of 40.7%, at 480 Mw. That this kind of performance is backed up by solid experience is borne out by the fact that the Clinch River Station of Appalachian Power Co, consisting of two 225,000-kw units, a part of the AEP System, had an *annual efficiency for 1960* of 8,975 Btu per net kwhr to feeders.[8] This is an annual efficiency of over 38%.

These are records of performance tested over short periods in one case and obtained over a year's performance in the other. They are not design projections. Again, it is necessary to point out there can be no comparison in weight given to figures of expected performance as against actual performance, in any major engineering project.

In the face of the vast difference in time scale in design, construction, installation, and performance in actual operating experience with large, highly-advanced steam-electric generators and generating plants in the two power economies, it is obvious there can be no question where leadership in this important field lies. At the least, Russian technology is seven years, and may, perhaps, be ten years behind American practice.

Operation of Interconnected Systems

In his review of our previous article in the November 2, 1959, issue of Electrical World, A. P. Rozhdestvenski[2] makes a very curious comment on the interconnected system operation in the United States. He says: "It is also hard to understand why in the USA there has been such a weak development of power systems and electric connection between them. In the USA there are mainly developed electric networks with a voltage of 132 and 220 kilovolts and only in one region is there a network of 380 kilovolts. It would appear that with such a large generally established electric power capacity existing in the USA the creation of powerful power systems with transmission lines, connecting them with a large transmission capacity, would produce beneficial economic results and considerably raise the reliability of electric supply. Furthermore, it would appear that the time zone difference could be utilized for transmission of electric power from east to west. No doubt these questions are associated with social factors."

This offers a perfect example of the obscuring and confusion of technical questions with technical, ideological dogma. Here are a few facts for reference:

1. In the United States there are in service at present about 2,000 circuit miles of 345-kv transmission with another 1,040 circuit miles of 345 kv under construction. In contrast, as of the end of 1958, according to the best information available, Russia had in service some 2,440 km (some 1,500 miles) of 400-500 kv circuit. Undoubtedly with the development of the 1959-1965 Russian power program more 400-500-kv transmission will go into service, but for that matter so will additional extra-high-voltage transmission, running into many thousands of miles, be installed in the United States.

2. In the US, integration or interconnection has taken place on a regional basis. This has been a historic and natural development because the geography of the country lends itself to regional as against national power pools. These large interconnected groups or pools not only operate in parallel but exploit completely in some cases, only partially in others, all the advantages of mutual back-up, diversity, coordinated construction, economy exchange, and other advantages of interconnected operation. Some of these regional pools operate as completely or fully coordinated pools while others operate as large interconnected groups with one or more formal or informal pools within the larger groups. But these large pools or groups have within themselves generation capabilities in one case at least as large as the total generating capacity in all the USSR. Specifically, there are in existence at the present time the following important power pools or groups:

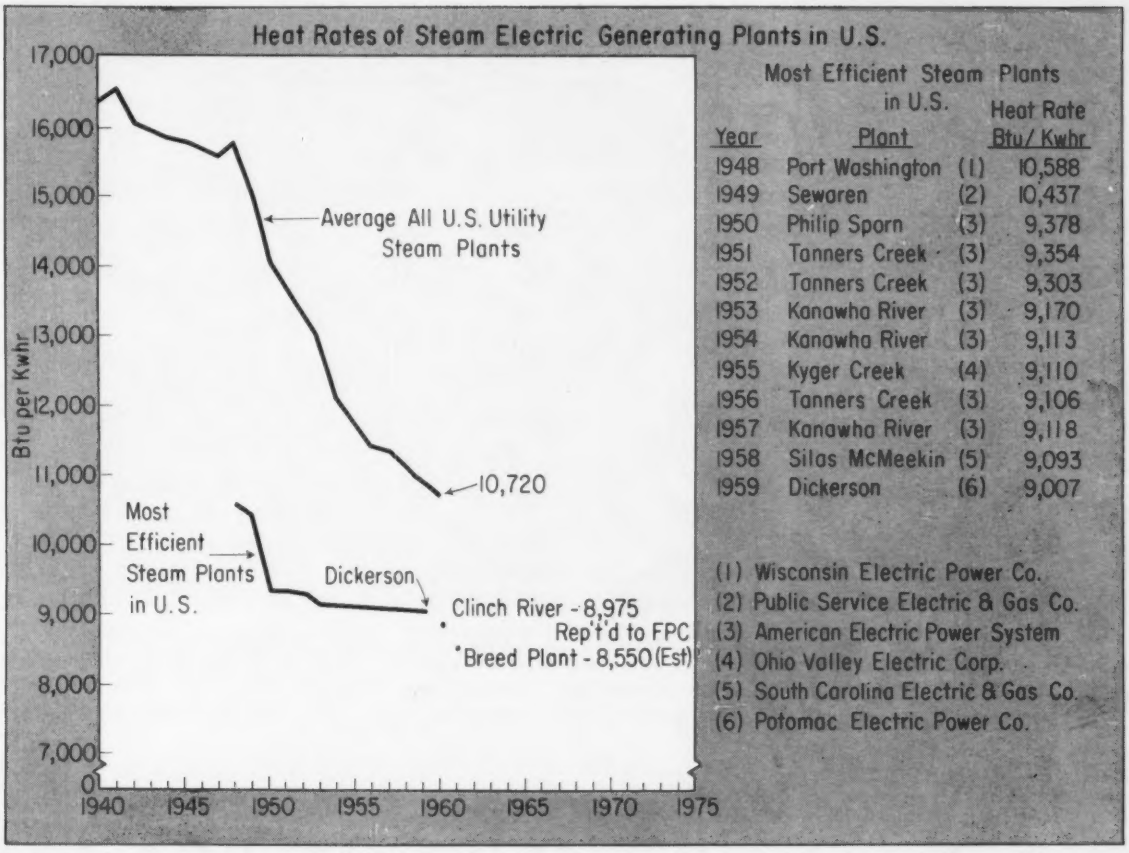
Northwest Power Pool, having a combined peak of 11,500 Mw, operating in portions of the states of Idaho, Montana, Washington, Oregon, Utah, and southwestern British Columbia (Canada), is interconnected with companies in Colorado and Wyoming.

Pacific Southwest Group, operating in Arizona and portions of California and Nevada, has a combined peak of 7,400 Mw. This is an informal group.

The Pennsylvania-New Jersey-Maryland Interconnection, having a combined peak of 11,900 Mw, operating in the states of New Jersey, Delaware, and portions of Maryland, Pennsylvania, Virginia, and the District of Columbia, is a formal pool with coordinated construction, maintenance, operation and dispatching.

The Canadian-US Eastern Interconnection has a combined peak of about 36,000 Mw. It operates as a large interconnected group in the states of Maine, New Hampshire, Vermont, Rhode Island, Massachusetts, Connecticut, New York, and a portion of Michigan, and in the provinces of Ontario and Quebec (Canada). This group is made up of several formal and informal pools and operates interconnected to take advantage of the emergency back-up and economic scheduling of generation.

The North Central Area Group is a portion of the Interconnected Systems Group. It operates as an informal pool in the states of Indiana, Ohio, West Virginia, and portions of Maryland, Michigan, Pennsylvania, Virginia, Kentucky, and Tennessee. It has a combined peak of 19,100 Mw and includes several formal pools. The entire group, during periods of



HEAT RATE RECORDS of US steam-electric generating stations for 1940-1960 reflect solid experience with advanced steam conditions. Average heat rate of all US utility steam plants has dropped 3,280 Btu since 1950

tight capacity, has closely coordinated construction, maintenance and substantial portions of their operation.

The Interconnected System Group, having a combined peak of 64,500 Mw, operates in parallel in portions of 30 states. The installed generating capacity of this pool is greater than the total capacity of USSR. This group includes several formal and informal pools, such as the North Central Area Group.

In the light of the very meager information about physical facilities, the tightness or looseness of interconnection, the routines for coordinating the instant to instant operation of large Russian interconnected area as contrasted with the specific information given here, one cannot help but conclude that Rozhdestvenski's comments about US interconnection have very little direct relationship to the actual situation. Indeed the probability is quite strong that interconnected and integrated operation is in a much higher state of technological and organizational development in the US than it is in Russia.

Perhaps, however, the exchange of views for which Rozhdestvenski makes a plea, if undertaken at a high level of authority and competence, and with full understanding that they would develop for each side basic philosophy, criteria of design, actual construction, and operation of the other side's system and facilities, would produce for each side more knowledge about the other's thinking and systems. Such an exchange would also bring to each side experience of the other side. This would be of inestimable benefit. But no such interchange, it must be pointed out, can have anything but minor value if it is restricted to superficial exchange of unorganized information and if either side attempts to substitute ideological declarations of faith for rational explanations. A proper exchange under the right auspices would be "a consumation devoutly to be wish'd."

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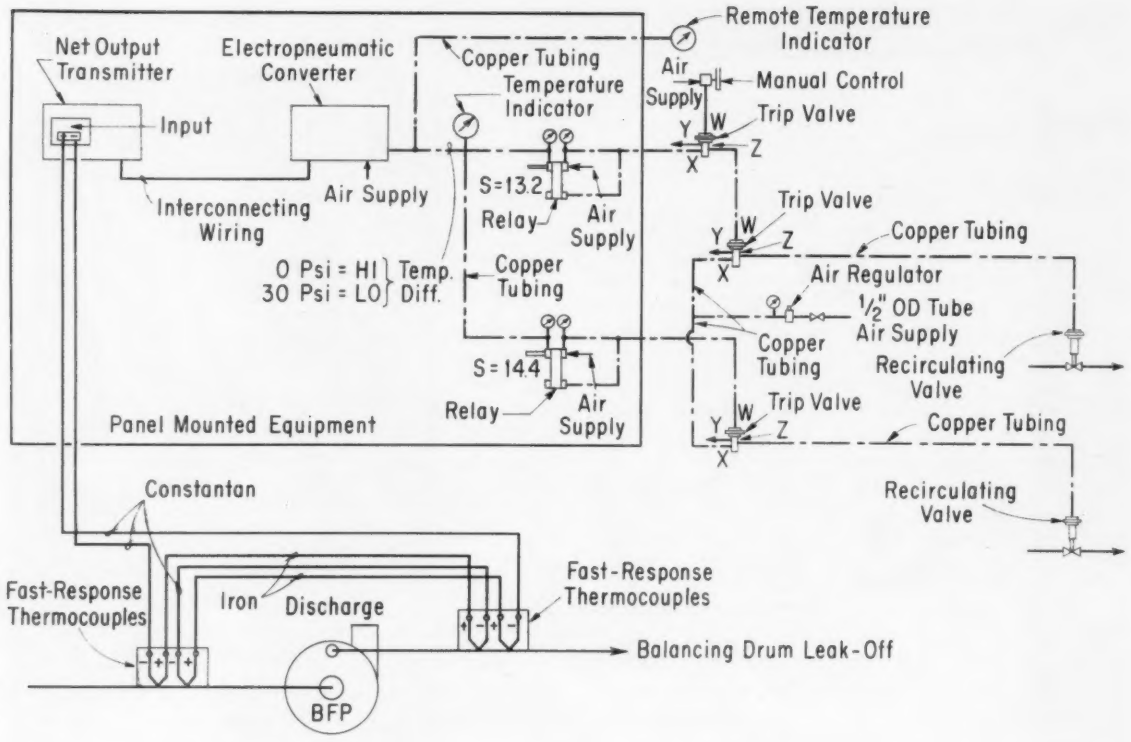


Temperature Differential Controls

'Fail-safe' system with fewer maintenance problems cuts valve operations, power needs in VEPCO BFP protection

J. D. RISTROPH, Manager—Power Production, and
STANLEY RAGONE, Superintendent—Production Results, Virginia Electric & Power Co, Richmond, Va.

Why not protect boiler feed pumps by controlling temperature rise, rather than by the familiar method of controlling boiler flow?

As the protection of boiler feed pumps depends on inhibiting temperature rise in the pump, controlling the temperature directly promised definite advantages to Virginia Electric & Power Co in the planning of its Chesterfield Station Unit 4.

The most obvious advantage was the fact that temperature-rise control does not involve the maintenance headaches associated with modulating or open-shut control valves and breakdown orifices. And such control seemed certainly feasible through the use of the new fast-response thermocouples along with new and relatively trouble-free electronic systems.

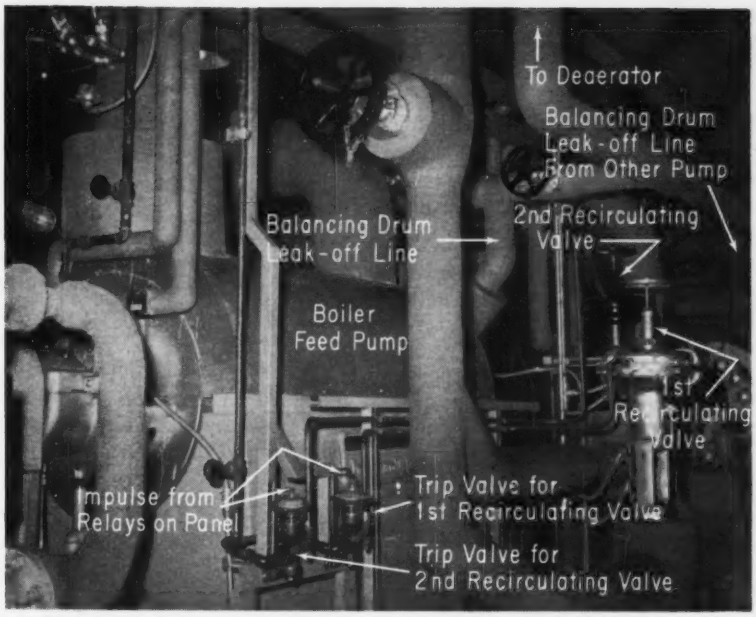
With today's designs featuring one boiler feed pump per unit, pump performance has become as critical a factor in the generating station as the boiler, turbine, and generator. Protection through temperature-rise control has been under investigation for several years, but VEPCO believes that the system it has pioneered is the first installation of its kind in the industry. Hagan Chemicals & Controls, Ingersoll-Rand Corp, and Stone & Webster Engineering Corp cooperated with VEPCO in developing it.

This new system employs the temperature rise across the boiler feed pump as the sensing device for controlling operation of the BFP recirculating valves. It is a "fail-safe" system, having the speed of response necessary for protecting the two Ingersoll-Rand 60% boiler feed pumps. Each of the latter has a rated capacity of 705,000 lb per hr at 2,700 psig TDH at 345F.

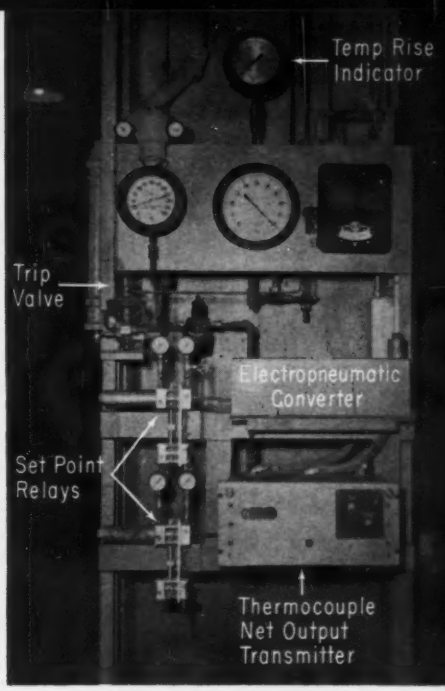
The control system consists of two fast-response thermocouples in parallel in the suction line of the boiler feed pump connected to two similar thermocouples in the balancing drum leak-off line to measure the temperature rise across the pump. The balancing drum leak-off line was chosen instead of the pump discharge to guarantee the flow of water past the thermocouples measuring the temperature rise across the pump.

Thermocouples Special

The thermocouples are in a special, thin-walled, high-pressure case which does not require a thermowell. The time of response has a range of 1 to 2 sec. The net output of the thermocouples is fed into a temperature-difference transmitter, whose output, in turn, feeds an electro-pneumatic converter. The millivolt signal is converted in the elec-


To Deaerator
Balancing Drum Leak-off Line From Other Pump
Balancing Drum Leak-off Line
2nd Recirculating Valve
Boiler Feed Pump
1st Recirculating Valve
Impulse from Relays on Panel
Trip Valve for 1st Recirculating Valve
Trip Valve for 2nd Recirculating Valve

RECIRCULATING VALVES of Unit 4 at Virginia Electric & Power Co's Chesterfield Station are controlled by the temperature differential across BFP



TEMPERATURE DIFFERENTIAL SYSTEM controls BFP recirculating valve operations by using the temperature rise across pump as the control signal

NET OUTPUT of thermocouples is fed into temperature-difference transmitter, whose output, in turn, passes into the electro-pneumatic converter

Boiler Feed Pump Recirculation

tro-pneumatic converter to an air loading signal proportional to the temperature rise across the pump. As the loading signal reaches the system set point, a pneumatic relay releases the air pressure above the valve diaphragm, allowing the valve to open.

The first valve on each pump is set to open when the temperature rise across the pump is 20F. The flow produced is about 325 gpm, sufficient to satisfy all normal recirculating requirements. When this flow is insufficient and the temperature differential rises to 24F, the second valve opens to allow an additional 180 gpm of recirculation. This second valve recloses when the temperature differential drops to 18F. The first recirculation valve recloses when a temperature differential of 14F is reached. These points are set in accordance with the recommendations of the pump manufacturer.

One indicator mounted at the pump and another on the board from which the pumps are controlled continuously show the temperature rise across each boiler feed pump.

The system has every possible provision to insure "fail-safe" operation. An open circuit of the thermocouple immediately causes the valves to open. In 80% of the known possibilities of failure due to malfunction of a tube, a failure causes immediate recirculation. In the remaining possible 20%, the valves drift open with full pump protection. In the event of air failure, the valves open due either to leakage from the valve diaphragm or from decreasing control air pressure. An electrical power interruption also causes the valves to "fail-safe."

False Difference Sensed

During early initial operation, difficulty was encountered in the operation of the system when only one boiler feed pump was in service because of reduced load on the station.

The balancing drum leak-off lines from the two 60% boiler feed pumps are joined in a common header which returns the leak-off to the deaerator. When only one pump is in operation, the hot discharge from the one operating flows past the sensing thermocouple in the balancing drum leak-off line of the idle pump. As the suction line to the idle pump is large in diameter and relatively static, a false temperature differential would be sensed on the idle pump and its recirculation valve would open.

To prevent this, modifications to the system wiring were made. When the pump motor is de-energized, the recirculating valves on that pump open and stay open until the pump is placed back in service. In this arrangement, the balancing drum leak-off of the pump in service also keeps the idle pump warm and ready for immediate startup.

On three occasions the fail-safe operation of the recirculating system functioned. One failure was due to interruption of power supply, and the other two were caused by tube failures. These tubes have a life expectancy of 10,000 hr, yet failed in

(Continued on page 98)

Cheap Residential Underground

Experience shows Canadian utility value of liaison among principals, ducts, cable selection, transformer cutouts; underlies standards developed for new residential subdivisions

B. D. **FLEMING**, Manager and Chief Engineer, Hydro Electric Commission of the Township of Toronto, Toronto, Ontario, Canada

Adopted from a paper at Canadian Electrical Association's Eastern Zone Winter Meeting, 1961.

The cost of constructing underground for a new modern residential subdivision can be cut to where so-called low-cost distribution is not low-cost at all. There are limits to the economies practicable in such construction, immediate savings often entailing future substantial outlays for maintenance and replacement.

In general, these are the limitations, based on its own experience, which the Hydro Electric Commission of Toronto Township imposes on its own cost cutting on all new underground distribution construction:

1. The closest possible liaison is maintained with other services going into the subdivision and with the subdivider and the builders.

2. Primary cable is laid in 3-in. polyethylene ducts, not simply buried. It has a metallic shield over the polyethylene insulation and a PVC jacket over the shield.

3. Cutouts are installed at each pad-mounted transformer cubicle.

4. Services, and secondaries where required, are polyethylene-insulated aluminum, fused at the transformer and buried in stone-free sand.

The Commission learned the necessity of these precautions from experience with its first underground installation. In all new work, these steps and specifications are now observed, available economies being carefully weighed against system reliability.

Hydro has in service about 9.3 miles of residential underground distribution, serving about 1,200 dwelling units; another 1½ miles have been planned to serve about 270 units soon. This is all residential underground distribution, not underground circuits or network systems in commercial areas.

The Commission's present building methods and techniques have evolved from a beginning some six years ago. Its present design is not cheap. Although there are more expensive installations in service, most installations in Ontario today were constructed at a unit cost less than those of the Commission's current practice.

Some municipalities have installed insulated wire in the ground, connected the wires at one end to overhead systems, carried the wires through the transformation stage, and connected the other end to 60-amp services in the homes. They then covered up such systems and

Table I—Underground Distribution Costs per 100 Dwelling Units

1. Underground costs for 100 units prorated on cost for 275 units	$27,400	
2. Transformer costs for 100 units prorated on cost for 275 units	$8,200	
3. Balance of costs are for primary, secondary, and service	$19,200	
4. For a subdivision where 75 to 100% of 100 homes are heated electrically:		
Transformer costs will average 2.5 times the above	$8,200	$20,500
Distribution costs less transformers will average 25 to 30% greater than the above $19,200		24,500
A portion of approximately $100,000 of substation and feeder plant is chargeable		30,000
Total cost		$75,000
Subdivider's share		−27,000
		$48,000
Rebates—100 @ $220		22,000
Total investment		$70,000

Table II—Underground Operating Costs per 100 Dwelling Units

Established Constants:	
1. Fixed charges on debentures	9.5% per year
2. Depreciation on plant	2% per year
3. Administration, operation, billing, collecting	$25 per unit per year
Operating Costs:	
1. Fixed charges on $70,000 at 9.5%	$6,750
2. Plant depreciation at 2%	1,500
3. Administration, billing, etc. at $25 per unit	2,500
4. Cost of power	
(a) Gold Medallion—100 at $175. per year	17,500
Total	$28,250

Table III—Revenue from Sale of Power to 100 Dwelling Units

Gold Medallion homes including electric heat, 100 at $390 per year	$39,000
Operating Costs (from Table II)	28,250
Net Revenue	$10,750

May Prove Costly in Long Run

forgot about them. Such municipalities could probably produce figures showing a cost ratio of underground to overhead of 1.5 to 1. And, chances are, such municipalities can honestly report three years of trouble-free service. Some lucky ones may show another three or even 13 years of trouble-free service.

But the writer says to any utility now planning an underground system or expanding its present system into residential areas, that it can't construct such a system with low-cost planning, low-cost materials, low-cost methods, low-cost techniques, low-cost labor. It is not producing the end result known as a low-cost ground system. In actuality, it is producing and will ultimately have a very high-cost underground system. Here is an example.

The Commission completed in 1955 its first underground installation which had been begun a year earlier. It was intended to serve about 300 homes, all single-family, medium-cost dwellings.

Toronto Township was booming in 1954, and house construction was just getting into stride. A subdivider, competing with other subdividers throughout the metropolitan area, wanted to offer a big selling feature for his homes and was prepared to defray a sizable portion of underground distribution costs. Nevertheless, he instructed the Commission to keep its own underground costs as low as possible.

The clean, fine sand enticed the Commission into direct burial of all circuits, primary as well as secondary. The Commission did, however, place concrete slabs to protect the primary against deep diggers. The slab was subsequently replaced by a creosoted plant and then by a clear wooden plank. A back-hoe did the trenching at a very low cost per foot, and a bulldozer was used for backfilling after crews had tossed in the wires and protective covering. Weather permitting, crews completed 1,000 ft per day.

No Cutouts Installed

Transformers were installed in semi-buried kiosks of well tile without reinforcing steel, and the primaries were looped into the kiosks from the ground and tapped directly to the transformers without cutouts. Costs were pared so low, in fact, that the final figures were practically on a par with those of equivalent overhead distribution. That was in 1954. For the first two years, Hydro had trouble-free service.

In the third year the Commission had the odd cable failure, the odd spring flooding of a kiosk that cracked the following winter. Nothing too serious. But in the fourth year a few primary cables failed, one bad section causing particular concern. About 1,000 ft were dug up, right through flower beds, rose bushes, fences, hedges, patios, trellises, flowering shrubs. Then ducts and a different type of primary cable were installed.

Oddly enough, this particular project brought Hydro a good deal of customer good-will, although at first it could forecast nothing but grief. But the contractor on the job took such precaution that the trenching was hardly discernible after two weeks. Then came the fifth year with its interruptions and customer bad-will due to them. Something drastic had to be done.

In these straits, the Commission approved complete rebuilding of the area's system, using temporary poles and standing street-lighting standards for draping temporary wires as an interim measure until the the low-cost underground system could be replaced. By last December, the Commission had replaced the entire underground system serving about 300 homes. That was the last of its

(Continued on next page)

Table IV—Return on Underground Distribution Depends on Electric Heating Load

Conditions in Subdivision	Gross Revenue	Annual Cost	Net Revenue	Profit on Operations, %	Return on Invest., %
100% Gold Med. (Incl. heat)	$39,000	$28,250	$10,750	27.6	15.4
75% Gold Med. (Incl. heat) 25% All Gas	30,000	23,750	6,625	21.8	10.3
50% Gold Med. (Incl. heat) 25% Bronze Med. 25% All Gas	22,750	18,425	4,325	19	9.62
50% Gold Med. (Incl. heat) 50% All Gas	21,750	17,610	4,140	19	9.5
25% Elec. Heat 50% Bronze Med. 25% All Gas	14,000	14,250	−275	−1.96	−0.70
10% Elec. Heat 25% Bronze Med. 65% All Gas	8,495	9,730	−1,235	−1.45	−5.35
100% Bronze Med.	8,500	10,660	−2,160	−25.45	−8.5

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METER DEPARTMENT

GENERAL ELECTRIC

Cheap Underground Costly

(*Continued from page* 59)

low-cost underground system. Here is what the Commission learned:

1. Installation of the electric circuits coincided with, or preceded that of other services on the right-of-way, such as water, sewers, etc. Consequently, the Commission was never sure, once its cables had been installed or backfilled, whether they would stay put. Crews were recalled often to splice conductors broken by a backhoe or dragline or cut by a pick or shovel. Several cable failures, the Commission believes, were direct results of the insulation being stressed shortly after installation.

This experience indicated the need for close liaison between the electric utility and the other services going into the subdivision, as well as with the subdivider and builders. It also indicated the need for very careful scheduling. Builders, it was demonstrated, must be made fully aware of the differences between an underground and the standard overhead system. When the subdivision is a large one, meetings between the electric utility and other parties should be regular and well organized and should concentrate on personnel becoming acquainted with each others' problems.

2. Although direct-buried secondaries, when the conductor has extra insulation and is properly installed in sand, seem to stand up, the Commission will not install primary conductors in this manner. Primaries will be placed in ducts which, in turn, will be properly installed. Such ducts serve two important purposes, the chief one being provision for removing and/or adding cable without excavating. On main feeders a spare duct is equipped with a fish wire.

Secondly, ducts can be installed and backfilled before the high-cost primary cable is brought to the site. When most of the excavation for other services has been completed, and the likelihood small that anyone will gouge out the ground for a large catch basin on top of the circuits, the primary cable is pulled in and connected.

3. The primary cable must have a metallic shield over the insulation and a jacket over the shield. It may be a polyethylene-insulated conductor shielded with a PVC protec-

tive jacket or rubber-insulated with a Neoprene jacket.

Tests by the supplier of cable removed from one section of the original subdivision revealed that its dielectric strength had deteriorated because of internal stresses. He could not establish how the stresses were initiated, whether by the die during manufacture or during installation. The stresses were there, however, and were contributary to ground faults.

4. The Commission requires cutouts of some sort at each transformer for ease and speed of operation. Though fairly costly and space-consuming, cutouts save time, especially when 50 to 100 homes are darkened by a power interruption in the dead of winter. Cold fingers and materials make a workman's task difficult when he is splicing cable into a transformer kiosk.

With this experience behind it, the Commission designed an underground distribution system for the new Park Royal development. In this area, electric service went underground at the rear, where it shared a trench with Bell Telephone cable and a television distributor from a centrally located receiving antenna.

For one section, consisting of 275 homes, main primary conductors are 4/0 copper, polyethylene insulated, copper shielded, PVC over-all jacket. The insulation and jacket were ordered in accordance with rigid specifications recommended by the Ontario Hydro Electric Commission's testing and research division. Primary laterals are No. 4, 7-strand copper, with the same type of insulation and jacket. Primary mains and laterals were pulled into ducts after the service conductors had been installed and the trench backfilled.

Ducts are 3-in. polyethylene pipe. Couplings were made thermally, and the ducts are protected by at least 3 in. of a high-quality, stone free sand. The ducts were laid only after the trench bottom had been tamped and consolidated. Sections of duct that cross over sewers or water mains were encased in reinforced concrete poured on the job.

In this subdivision, there are no secondary mains. Service to each home originates at a bus bar with a current limiter at the transformer and goes directly to the outside meter base at the house. Studies have indicated that this arrangement is more economical for back-lot construction than a secondary main. Furthermore, a service fault can be isolated at the transformer without disrupting service to other customers.

Services are No. 2 aluminum, polyethylene insulated. As services are direct buried, their insulation thickness is made greater than standard line-wire insulation, and a higher grade polyethylene is used. At least 9 in. of high-quality, stone-free sand go on top of the services.

Transformers are surface mounted in metal cubicles on concrete pads, and the cubicle's high-tension side can be removed for transformer installation or removal. A small, hinged panel on the opposite side, when opened, exposes the secondary connection and fuses. The lid is also hinged to allow top inspection and facilitate operation of the bayonet sectionalizers.

Underground distribution construction costs for this section of Park Royal were as follows:

1. Transformers, including materials, labor, truck, and overhead $22,600

2. Distribution, including materials, labor, truck, and overhead for trenching and direct work, primary, switching compartments, terminal poles, etc. $42,100

3. Services, including material, labor, truck, and overhead, fusing connections at customer's meter base. (Trenching on customer's property is borne by subdivider) $10,800

Total $74,500

This phase has 275 separate units, so that the average cost is $274. Some units are half of a semi-detached dwelling. The 1,325 kva of transformers for 275 units represents 4.82 kva per unit.

A breakdown of costs as a percentage of the total produces:

Transformers	30%
Distribution	56%
Services	14%

The Commission has since completed the underground system serving the first 25 of a planned 400

(*Continued on next page*)

GENERAL ELECTRIC
Over a Decade
of BUTYL Leadership and Experience

IN 1950...FIRST INDOOR-OUTDOOR CURRENT TRANSFORMERS

Butyl molding of General Electric instrument transformers made possible the first indoor-outdoor current transformers—the JKP-O—introduced by General Electric *in 1950*, helping utilities reduce stock requirements, cut inventory costs.

Eleven years of performance-proved service have made General Electric butyl-molded instrument transformers the *leaders of the industry*.

Contact your G-E Sales Engineer for complete information on General Electric's full line of butyl-molded instrument transformers—600 to 15,000 volts—or write General Electric Co., Somersworth, N. H.

METER DEPARTMENT
GENERAL ELECTRIC

To provide utilities with a new means of low-cost indoor and outdoor metering, *in 1954*, General Electric extended its butyl line to include the first butyl-molded *miniature* current transformers—the Type JCA-O.

Butyl-molded construction—a development of General Electric research—made possible this smaller size, lighter weight current transformer—lowering the cost of metering installations.

G.E.'s butyl line offers: current; potential; indoor-outdoor; window; bar; wound; miniature; fused or unfused; 600 to 15,000 volts. Contact your G-E Sales Engineer or write General Electric Co., Somersworth, N.H.

714-02

METER DEPARTMENT

GENERAL ELECTRIC

Cheap Underground Costly

(*Continued from page* 61)

homes in a much smaller subdivision. A prestige-type area, these homes start at $35,000. All lots have at least a 100-ft frontage and are wooded. Many of them overlook ravines, which obviate electrical plants in the rear. Accordingly, the lines are on the boulevard side of the sidewalk, and in their own trench.

This trench is only 18 in. deep and 15 in. wide. Primary conductors are in polyethylene duct surrounded by sand. But it was found more economical in this case to install secondary mains and service pedestals, rather than individual services from the transformers to each home. The mains are polyethylene-insulated 4/0 aluminum, directly buried in sand 3 in. above the primary duct. All other features are similar to those at Park Royal.

In the newer undertaking, the total cost for 25 lots was about $6,400, average per lot being $256. This subdivision cannot be considered typical.

In a comparison of the unit cost of underground and of the Commission's standard overhead service, the latter, it must be noted, may be somewhat higher than those of other municipalities for two reasons:

1. Rightly or wrongly, the Commission bases the capacity of distribution transformers on an ultimate diversified load of 4 to 5 kva per service;

2. Hydro has concrete poles throughout all residential areas, and its average costs for a similar subdivision run about $134.50 per lot. The extra amount to be paid for underground service is thus about $140 per lot.

When allowance is made for areas in which overhead costs are less than the Commission's and underground costs higher, the difference between overhead and underground distribution becomes $170 per lot. Even this is only 1% of the cost of a $17,000 home, an amount which will purchase only a fair TV set, but not an automatic washer. Not enough to put an automatic transmission in the family car, that $170 would only get a homeowner barely started on the construction of a recreation room and might or might not be enough for hard-surfacing the driveway.

The Commission's rates are not yet designed for providing underground distribution in all residential areas, nor does it have on hand a surplus with which to attempt such a program. The money must come initially for the subdivider, ultimately from the homeowner. But the Commission can sell many subdividers on the improved aesthetic properties and the upgrading of value in the homes. The more utilities advocate underground residential distribution, the faster it will catch on until, sooner or later, it becomes standard construction in urban and suburban areas. And the wider its use and the more certain its standards, the less underground distribution will cost.

The Commission serves about 40 homes with electrical heat, half of them scattered but half in a single subdivision. Hydro is accumulating basic load characteristics and making computations on the actual costs of such service. Certain factors have had to be assumed, as this type of load is still too new to yield absolute values. The Commission hopes, however, that these efforts will lead to definite conclusions about the load's effect on feeder and system peaks.

Objectives Stated

The purpose of the Commission and other utilities is to develop a suitable plan, combining Gold Medallion homes and residential underground wiring with these objectives: To stimulate greater use of electrical energy until such use is reflected in improved energy rates; and to improve the distribution of such energy.

And yet this question remains: Can the Commission install underground distribution economically, while maintaining rates patterned for overhead distribution? In its area electrical energy, in competition with natural gas for heating, is sold at 1.5¢ per kwhr.

The Commission's policy is to provide an underground distribution system for a subdivider at a certain cost to him, depending on the width of lot and number of lots. The wording is as follows:

"Where a subdivider desires an underground distribution system, and his subdivision is 100 lots or less, he is assessed a certain sum of

money for each lot, depending on the frontage, as in this table.

(a)	100-Ft lots and over.....	$295
(b)	80-Ft lots to 99.9.....	290
(c)	60-Ft lots to 79.9.....	280
(d)	50-Ft lots to 59.99.....	270
(e)	Semi-detached homes ...	520

"Where the number of lots or units in the subdivision is in excess of 100, then it will be necessary for Hydro to prepare an estimate of the total cost of the subdivision, and to require an advance payment to the township treasurer, for all or a portion of the subdivider's share, before Hydro can commence construction.

"This assessment per lot does not include the cost for installing the service to the home. Hydro will make the necessary provisions in the area of the rear property line and leave sufficient cable to extend to the point of delivery at the dwelling . . . . . Should it be necessary to construct the system from late fall to early spring, then these 'costs of subdivider' could be higher.

"In order to encourage underground distribution, and to provide a profitable return from its underground capital investment, the Commission has agreed to . . . a rebate . . . to both subdivider and builder where the electrical systems in the homes . . . meet these requirements:

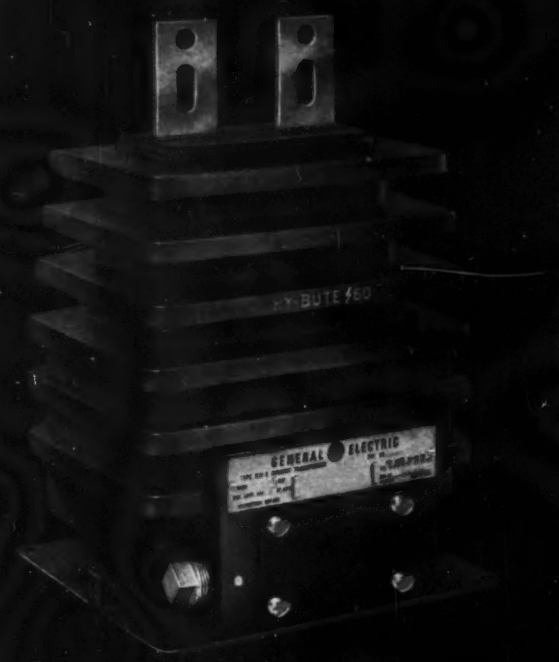
	Subdivider	Builder
Gold Medallion...	$100	$120
Bronze Medallion plus total electrical heating...	100	100
Electric heating only....	75	75
Bronze Medallion only.	25	25

"Briefly, a Gold Medallion standard electric installation must be all electric, including heating, and have at least three major electrical appliances (built-in or free-standing), with provision for five more. A Bronze Medallion standard requires an electric water heater installed with provision for at least four more major appliances.

"There are, however, some certain restrictions to this Hydro policy. Before it becomes anywhere economical to install an underground system, a minimum of 50% of the homes must be of the Gold Medallion Standard or equivalent."

GENERAL ELECTRIC

Over a Decade of BUTYL Leadership and Experience



IN 1955 ... FIRST

HY-BUTE/60 MOLDED TRANSFORMERS

To meet the special needs of high voltage, outdoor applications where creep-tracking and corrosion presented unusual problems, General Electric *in 1955*, announced the JKW-5 outdoor current transformer—the first HY-BUTE/60 molded instrument transformer.

HY-BUTE/60—a compound of butyl—is another General Electric development. Butyl construction—introduced in 1949, is now the *leading instrument transformer insulation*. Whatever your instrument transformer needs, General Electric offers the most complete line of *butyl* or *HY-BUTE/60 molded units*—600 to 15,000 volts—to meet all requirements.

For full information contact your General Electric Sales Engineer, or write to General Electric Company, Somersworth, N. H.

METER DEPARTMENT

GENERAL ELECTRIC

GENERAL ELECTRIC

Over a Decade of BUTYL Leadership and Experience

IN 1958 . . .

In 1958, General Electric introduced the *first butyl-molded potential transformers*—both indoor and outdoor designs—providing utilities with another new way of reducing relaying and metering costs.

The addition of the JVW-3 butyl potential transformer helped General Electric offer the most complete line of butyl-molded instrument transformers available: 600 to 15,000 volts; current or potential; indoor and outdoor units; combination indoor-outdoor designs; window; wound; bar; miniature; fused or unfused.

For full information contact your General Electric Sales Engineer, or write to General Electric Company, Somersworth, N. H. 714-03

GENERAL ELECTRIC

Electrical

PCEA sales group reports area strides at meeting in San Francisco despite 1960 national declines

Everyone cooperating benefits from the sale of electrical living, the Pacific Coast Electrical Association's business development section was told at its recent meeting at San Francisco, Calif. The benefits of such selling were enumerated by Darcie White, Utah Power & Light Co. They are:

1. The utility sells 20,000 kwhr instead of 3,800, the national average.

2. The wiring contractor gets a contract for $750 instead of one for $400.

3. The appliance dealer or distributor sells $2,700 in appliances rather than $1,800 worth.

4. The electric heating contractor (sometimes also the wiring contractor) gets a $900 job.

5. The lighting fixture dealer gets a $300 sale instead of a $75 one.

6. Equipment manufacturers benefit from the increased utility requirements for all components of the utility system.

Cooperation Boosts Sales

The effects of cooperation were evident in the 1960 sales of the Northern California Electrical Bureau, said Jack Ross, Pacific Gas & Electric Co. The bureau's appliance business was better than in 1959, despite a general decline throughout the country, he noted, citing appliance sales of $272 million, utility plant sales as $68 million, and wiring and installation work on customers' premises amounting to $2¼ million.

This was accomplished, Ross said, through mass promotion, including utility advertising and industry action to capitalize on such ads at the point of sale. He described the bureau as centered in San Francisco and having 33 local groups of retailers throughout PG&E service territory.

During the 1960 National Electri-

Living Sales Show Gains

H. F. HARTZELL, PCEA president, welcomes delegates to sales convention

cal Week, $20,000 worth of appliances were offered as prizes to registrants at dealers' stores, Ross said, and many thousands of dollars worth of appliances were sold to these "qualified" prospects. He gave as an example of the campaign's effectiveness electric range sales which gained 31% during the campaign week and showed a 10.5% gain in the following month over the previous year's sales. These gains were chalked up, Ross noted, while national sales dropped 8.3%.

Residential load has been increasing 300 kwhr per house per year, and electric cooking 50% per year on the PG&E system, reported Rod Doerr, who attributed much of these gains to the promotional campaign described by Ross.

Promotion of Medallion Homes has been highly successful in the Southern California Edison Co's service area, said T. M. McDaniel Jr. Gold Medallion Home sales were up 66% to 1,100, and Bronze Medallion 16% to 3,100 during the first three months of 1961, he added, noting that these gains were in addition to 6,700 Gold Medallion sales in apartments.

McDaniel explained that the same requirements prevail for apartments as for individual homes, with the exception that central laundry facilities in apartments are considered as meeting the requirements.

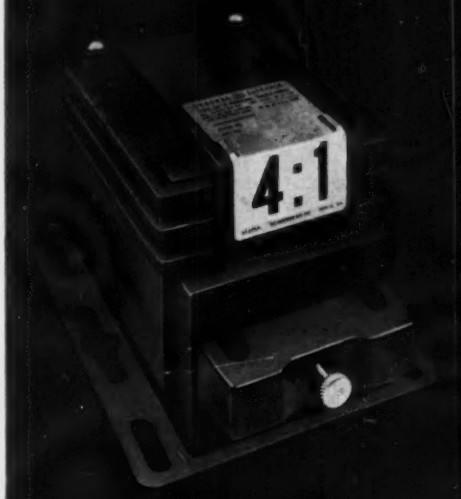
All-electric living in apartments should have high priority on the promotion budget, so that young couples who enjoy it in apartments will want it later in their own homes, said Arthur Goldman, *House & Home* magazine.

Noting that some companies emphasize the heat pump in their electric heat promotion, Doerr reported that 1,000 heat pumps are added yearly on the PG&E system, an addition of 75 Mw per year to 800 Mw of heating load on the line.

Doerr said that concentration of six or seven makes of water heaters would simplify promotion, and such a number would be sufficient to take care of all requirements. He cited a national trend favoring the fast-recovery water heater.

Jack Kiedaisch, Arizona Public Service Co, declared that lighting modernization promotion that begins by urging relighting of the bathroom gets off to a good start. Relighting the bathroom, he said, incurs a low investment, and the homeowner continues rewiring throughout the house.

GENERAL ELECTRIC
Over a Decade
of BUTYL Leadership and Experience



IN 1960...

Another new butyl-molded transformer from General Electric . . . the Type JVP-O, 600-volt potential transformer has set new standards of design; accuracy; burden capacity and voltage range.

Butyl-molded construction—a development of General Electric research—has been performance proved by over eleven years of dependable service.

General Electric leads the industry in producing industry's only complete line of butyl-molded transformers. Contact your G-E Sales Engineer for full information, or write General Electric Co., Somersworth, N.H.

GENERAL ELECTRIC

GENERAL ELECTRIC

Over a Decade of BUTYL Leadership and Experience

IN 1961 ... MORE BUTYL-MOLDED INSTRUMENT TRANSFORMER FIRSTS BY GENERAL ELECTRIC

So far this year, General Electric has announced four additional butyl-molded instrument transformers—the JCB-5 (left), the JCW-5 (center background), the JCM-3 (center foreground), and the JCD-5 (right) for indoor and outdoor application to operate meters, relays and control devices. Thirteen additional butyl-molded units will be introduced during 1961.

What's behind this history of General Electric's 'More than a Decade of Butyl Leadership and Experience'? Simply this, *savings through quality*. For example:

Butyl requires no maintenance—G-E butyl-molded transformers will not corrode, harden or crack with age or extreme weather; never need painting; are easy to clean, have no porcelain insulators to break.

Butyl lowers installation costs—Tough, flexible butyl construction protects against mechanical shock, damage; are up to 50% smaller, 33% lighter than other units of equal ratings for fast, easy handling.

Butyl cuts inventory costs—Any-angle mounting of G-E instrument transformers supersedes bottom, top and side-connected designs . . . simplifies stocking and ordering.

Butyl increases safety—Butyl cannot catch fire or explode. And at high voltage, G-E Hy-Bute/60® insulation prevents creep-tracking.

Whatever your application, select your instrument transformers from General Electric's complete line of butyl-molded units: current; potential; indoor-outdoor; window; bar; wound; miniature; fused or unfused; 600 to 15,000 volts. For more information, contact your G-E Sales Engineer or write General Electric Co., Somersworth, N. H. 714-04

METER DEPARTMENT

GENERAL ELECTRIC

Supports Save Manhours, Eliminate Hazards in Lifting Traveling Water Screens

JOHN LEWIS, Maintenance Helper, **MARVIN BURT,** Master Maintenance Man, Philip Sporn Plant, Central Operating Co, New Haven, W. Va. —AEP System

The use of simple support blocks to lift traveling water screens at Central Operating Co's Philip Sporn Plant saves about 288 manhours annually. Furthermore, since it is no longer necessary to have men inside the screen frame, a significant safety hazard is thereby eliminated.

When raising or lowering the traveling water screen in its guide, out of or into the water, it is necessary to make a series of successive lifts with the screenhouse crane. Several lifts are necessary because of the limited distance the screen can be rigged and lifted.

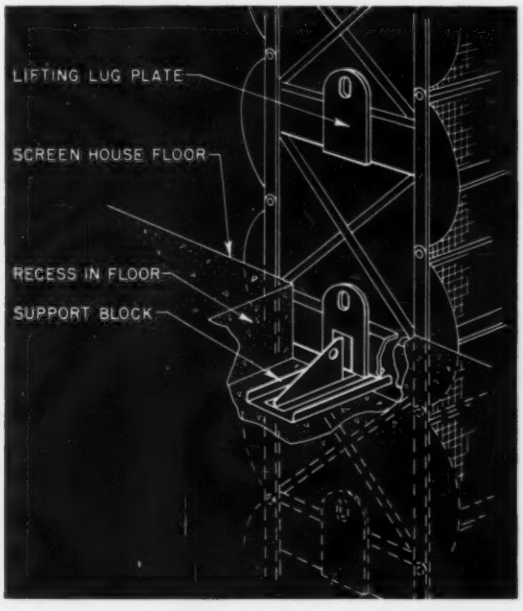
In the past, after each lift, I-beams 9-ft long were inserted between the two rows of screens to support the screen assembly as the new hitch was being made. These I-beams then had to be removed while lifting the screen to the next level. This required three men—two to handle I-beams while inserting them, and one man inside or partly inside the screen to guide the I-beam through the open framework.

By using the support blocks (arrow) a lift is made and one of these blocks is placed at each end of the screen, beneath and against the lifting lug on the screen frame. The block is inserted beneath one of the side rails so that the thrust plate is against the lifting lug plate. When the screen is lowered onto these blocks, the weight of screen on the portion of block beneath the side rail will carry weight of that side of screen. The block won't tip because the side thrust plate tends to keep it level. This is safe and possible because the screen is still in its guides and there is very little side clearance. Each time the position of the hoist is advanced, the blocks are removed and replaced after each successive lift. To lower the screen, one reverses the procedure.

The blocks are made of 8-in. channel, 22-in. long with ribs, base plate and thrust plate made of ½-in. steel plate. This is all-welded construction, which required about 2½ manhours of labor. All material used was scrap.

The use of these supports saves about 24 manhours in the removal and replacement of screen. Since each screen is raised an average of once a year for inspection or repair, and there are 12 screens at the Philip Sporn Plant, it is estimated that the new method saves about 288 manhours annually on this job.

SUPPORT BLOCKS hold traveling screen as crane is repositioned for each of a series of lifts (or lowerings)



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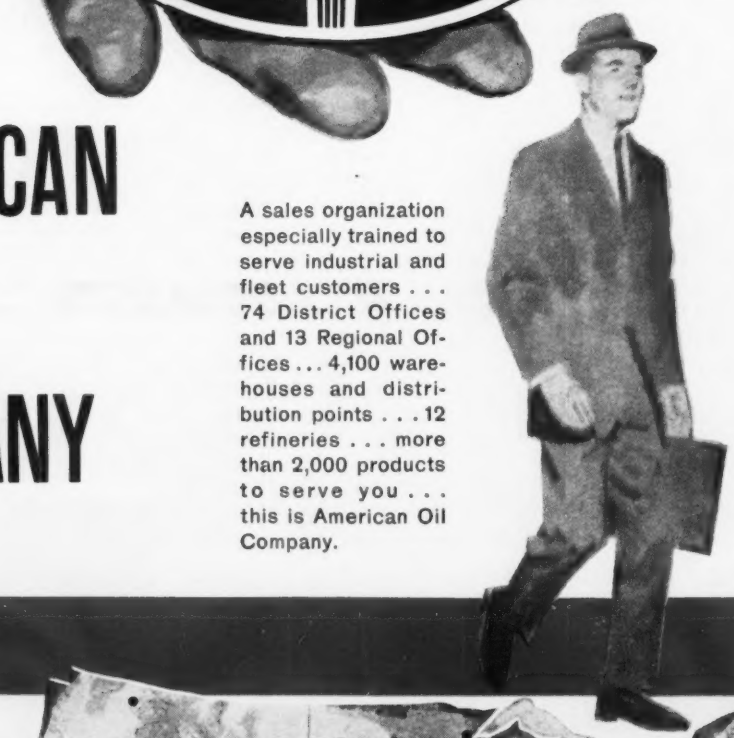
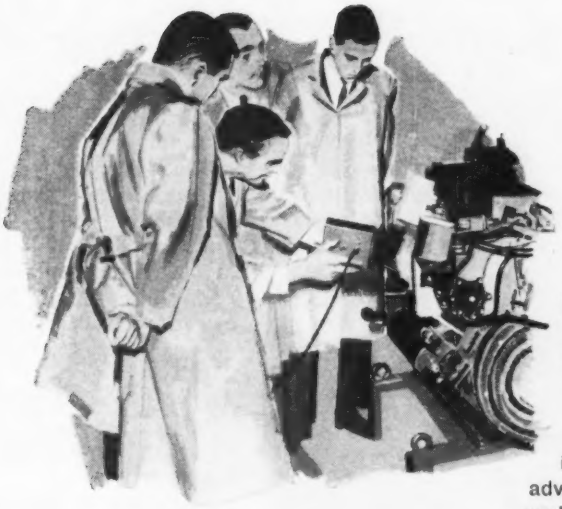
AMERICAN

A sales organization especially trained to serve industrial and fleet customers . . . 74 District Offices and 13 Regional Offices . . . 4,100 warehouses and distribution points . . . 12 refineries . . . more than 2,000 products to serve you . . . this is American Oil Company.





The American Oil Company representative who calls on you receives special training in servicing industrial and fleet customers at our Sales Engineering School. His training begins with a concentrated course in petroleum product quality and application. According to a planned schedule, he returns for an advanced course and then again for post-graduate work. From our Marketing Technical Service Department, your American Oil representative draws assistance, when needed, from specialists who are recognized authorities in their fields. These specialists may be called in at any time to work with you on your lubrication problems. More than a thousand research scientists and technicians at our research laboratory support the effort of our representative to serve you. Their mission: To help your American Oil representative help you lower your maintenance costs and stretch your maintenance dollars. Learn more about American Oil, its men, its service, its products.

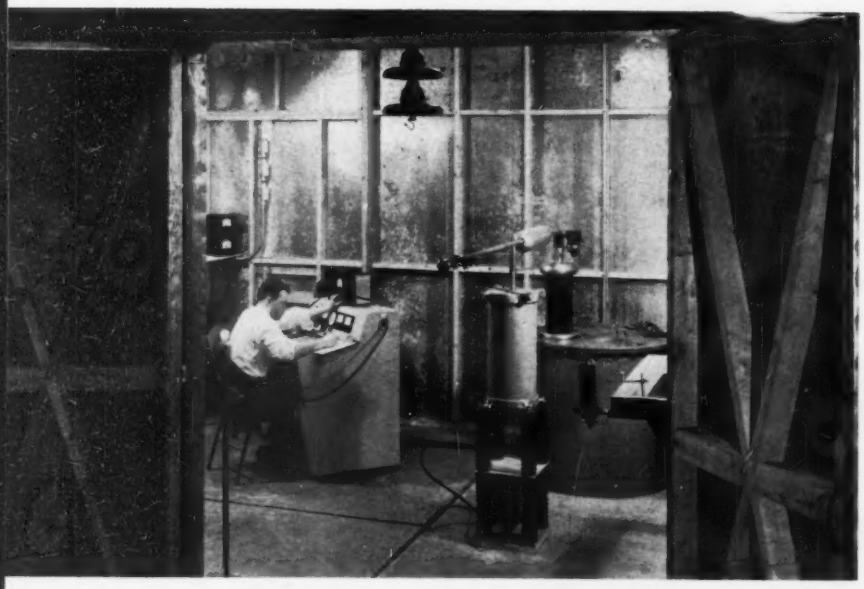
AMERICAN

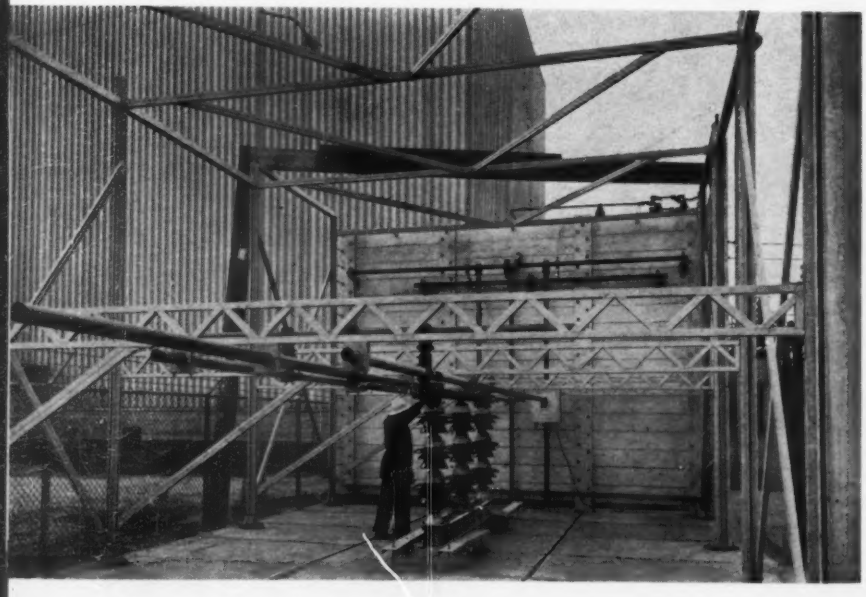
AMERICAN OIL COMPANY

910 S. Michigan Ave., Chicago 80, Ill.

Lab Opened to Industrial R&D Testing

The Hubbard-Kearney research laboratory near Chicago has recently been made available to the entire electrical industry for development testing of utility products. Laboratory facilities are offered to utilities which may wish to have certain tests performed for them on an impartial basis. Electrical manufacturers who desire to enlarge the scope of their development programs without investing in similar facilities, or who currently test at far-distant places, are invited to use the laboratory.





RESEARCH FACILITIES at the Hubbard-Kearney laboratory include a radio-influence voltage test cell (above), a momentary-current test structure (below)

The laboratory, which began operations in January 1958, was enlarged during 1960 to permit testing at higher voltages and higher current ratings. Major facilities now available include:

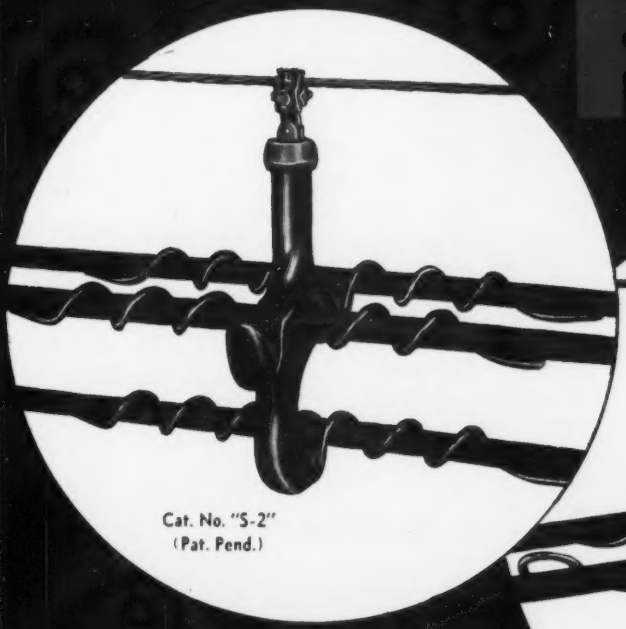
- 300/600-kv, 60-cycle test set, 270 kva
- Heat run to 40,000 amp continuous
- 3.20-Mv, 40-kw-sec impulse-voltage generator
- 80-kw-sec, 100-kv surge-current generator
- Momentary current 300,000-amp asymmetrical rms or 200,000-amp symmetrical.
- Power interruption testing, from 1.5 kv to 45 kv single phase.
- Mechanical testing to 200,000 lb in tension.

Although all of these facilities are required for the research and development programs of Hubbard and Kearney, some equipment is idle a high percentage of the time. Sale of the open time to other manufacturers or utilities will be made to permit greater progress from their development and testing funds. The income so derived will be used for future expansion of the laboratory facilities.

According to A. C. Westrom, director of the laboratory in McCook, Ill., rates for testing will be based upon the total cost of equipment in use, plus actual labor for operation, plus the cost for expendable equipment. Adequate security, often of concern in new developments, is provided by the availability of locked test cells and observation rooms. Original cathode-ray and magnetic oscillograms, plus high-speed photographs, become the property of the user if he desires to prepare the test report. Alternately, H-K laboratory engineers will prepare a certified test report with documentation according to their observations.

(*More News of Manufacturers, p* 72)

Another FARGO FIRST



Cat. No. "S-2"
(Pat. Pend.)

Cat. No. "S-2H"
(Pat. Pend.)

"S-2" SPACERS
. . . dependability of porcelain
. . . ease of installation

1. **FIRST** with wet process porcelain's proven weather resistance, long term dielectric strength, and self-cleaning for lifetime dependability.
2. **FIRST** with a spacer that can easily be installed with "hot sticks" without service interruptions.
3. **FIRST** with specially designed swivel action hardware which is ideal for grade and corner construction and, also, relieves stress on the spacer.
4. **FIRST** with high gripping power non-conductive tie wires to eliminate mechanical and electrical stress on the cable covering.
5. **FIRST** with a spacer that does not require special grommets to handle or stock for each size cable.

1. **PLUS**, just one unit with 6" on center spacing for 5 or 15 KV for cables from ¼" to 1½" diameter.
2. **PLUS**, wet and dry flashovers and RIV levels compatible with 15 KV systems.
3. **PLUS**, mechanical strength to support loads in excess of 2500 pounds and withstand the forces of faults well over 10,000 amperes.
4. **PLUS**, BIL values in excess of the published standard for 15 KV equipment, even with punctured cable.
5. **PLUS**, diamond configuration of the conductors for safe, easy access to each phase.

Ask your Line Material Field Engineer for complete details.

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Manufactured by
FARGO MFG. COMPANY, INC.
Poughkeepsie
New York

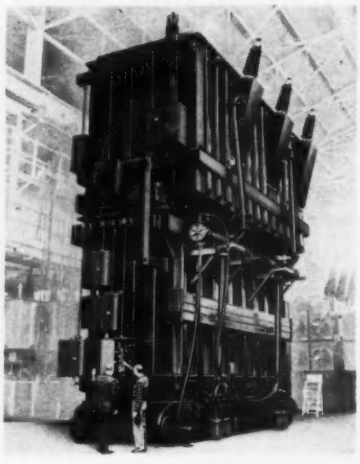
FARGO

Giant Unit to Test HV Transformers

Two sections of a huge test transformer were shipped recently to the Westinghouse Electric Corp's power transformer plant now under construction in Muncie, Ind. When assembled, the 440-ton unit is about 16-ft wide, 34-ft long, and 42-ft high and will be used to test power transformers in excess of 600 kv.

The new test transformer has three windings. One is a 13.8-kv delta winding rated at 20 Mva; the second is a 24-kv wye or reverse delta winding rated at 125 Mva; and the third is a 249-kv delta, wye or reverse delta winding rated at 125 Mva.

The 13.8-kv winding is supplied by a generator. This winding can be varied from 34 to 68 turns in one-turn steps, thus giving a 2 to 1 variation in the voltages on the other windings. The 24-kv winding is connected to a capacitor bank which supplies the reactive power to the transformer under test. The winding has a wye-reverse delta switch so that single-phase voltages from 6,490 to 42,210 v can be obtained. On the wye position, 3-phase voltages from 5,620 to 36,-560 v can be obtained. These voltages are gained by using the 13.8-kv winding, a 33-position URT load-tap changer, and a five-position no-load tap changer.



A total of 5,775 different positions for 3-phase voltages are available, and an equal number for single-phase voltages. The 249-kv winding will be connected to the load; i.e., the transformer under test.

The combination of switches and tap changers, which are all motor operated, make this one of the largest test transformers (in physical size) ever built.

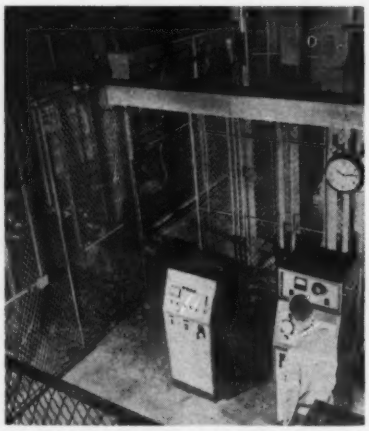
W&C Manufacturer Looks to Higher Voltages

To enlarge its service to the utility field, Hatfield Wire & Cable Division of Continental Copper & Steel Industries, Inc, recently put two new plants into operation at Linden, N. J.

One plant is an automated copper-rod mill which is now supplying copper rod to Hatfield's wire-drawing facility at Union, N. J. The Union plant produces both copper and aluminum wire, ranging in dia from 0.005 in. to 250 in.; in construction from seven to 127-wire concentric lay strands and in large cable diameters. It also produces concentric rope-lay strands from 49-wire (7x7) to flexible, stranded conductors containing over 5,000 individual wires. The aluminum rod is supplied to the Union plant by the Hanover Wire Cloth Division of CC&S.

The other new Hatfield plant at Linden is a 240,000-sq-ft rubber insulating mill which operates as an integrated facility with the Union plant. The insulating plant is capable of producing all types of rubber, neoprene and silicone-covered wire and cable—from the smallest single-conductor building wire to the large sizes of multiconductor power cable.

According to Hatfield, the new rubber-insulating plant was designed, and has been equipped, to manufacture and test a precisely-controlled quality product to keep pace with the company's move into the utility's higher voltages. Engineering, laboratory and quality-control staffs have been expanded accordingly. The 40-year-old company, in addition to its industrial business, mainly has supplied low-voltage distribution-type wiring to utilities. Now the new Linden plant is currently in substantial production of all types of power cable up to three-conductor 500 MCM cable, for 15-kv service—this plant is supported, as are the other Hatfield plants, by more than 20 Hatfield warehouses throughout the country. Production of cable for higher voltages is planned as the market develops.



TEST CENTER has 80-kv ac, 150-kv dc capacity; tests corona effects to 40 kv

New equipment in the Linden rubber-insulating plant includes: an extra-large-size cable closer, continous lead extruder, and vulcanizer. The vulcanizer can cure four 10-ft-dia reels simultaneously. Cable testing equipment includes: a high pot tester, with capabilities up to 80 kv (ac) and 150 kv (dc); a corona-sensitivity level tester which can detect current avalanches of 3.46 micro-coulombes; and a 50-kv modified Shering bridge with automatic-balancing guard circuit.

In conjunction with the two new plants at Linden, the Hatfield facility at Hillside, N. J., which formerly manufactured both rubber and plastic-insulated wire and cable, has been expanded and modernized for exclusive production of high-density polyethylene-covered wire and cable.

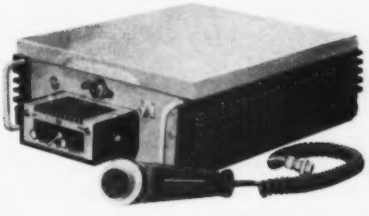
(*More News of Manufacturers, p* 74)

RCA "LD" 2-way radio has the guts to stand up to the toughest jobs!

There are rugged places where men, trucks and 2-way radios have to go, and each has to be a proven, reliable performer. In 2-way radio, this means quality must be built-in to take the gaff—quality such as only the leader in radio and electronics can offer—in the new RCA "LD" (Low battery Drain). Quality and price are combined in this dependable RCA equipment to give you the very best performance at the lowest cost. Use it on the roughest roads—Security Sealed Circuits are your assurance it can take it. Leave the radio on when your vehicle engine is turned off—battery drain is negligible—transistors are used in circuits where they have been proven to be most dependable.

It took experience and daring to bring you today's RCA 2-Way Radios. It meant discarding preconceived notions about circuits and redesigning with transistors in key places for reliability with economy. And it involved engineering a host of other advanced features to assure fine message intelligibility, and long component life at moderate cost.

Your RCA Communications Specialist will be glad to show you why the "LD", dollar for dollar, feature for feature, is today's greatest 2-way radio value. Or send coupon for further facts.



RCA

The Most Trusted Name in Radio

RADIO CORPORATION OF AMERICA

RADIO CORPORATION OF AMERICA
Telecommunication Center, Dept. UE-45
Meadow Lands, Pa.

☐ Please send me FREE literature on the new RCA Transistorized Mobile Radio.

☐ Have RCA Communications Specialist contact me and explain why this is today's best value in 2-way radio.

NAME_____ TITLE_____

COMPANY_____

TYPE OF BUSINESS_____

ADDRESS_____ PHONE_____

CITY_____ ZONE____ STATE_____

About that property of yours...

PAGE FENCE

These 3 VALUES are important

1. QUALITY is important. When you invest in a fence you want it to last for a long, long time. When you specify PAGE you get 77 years of our experience in the design and manufacture of a quality fence. Page Fence is engineered for long-lasting service and is covered by a Registered Certificate of Quality.

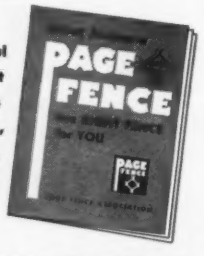
2. WIDE CHOICE is important. For example, we offer a choice of 4 chain link fabrics—ACCO-Aluminized, our latest development, or galvanized steel, stainless, or solid aluminum. Each of these has characteristics which meet individual preferences or make it more suitable to meet certain climatic or service conditions. Furthermore, there are 8 basic fence designs and 6 gate styles. No other company can serve you with so wide a selection.

3. INSTALLATION is important, too. A fence can be no better than the quality of its erection. The Page Fence Member in your locality is trained, experienced, responsible, and interested in your satisfaction.

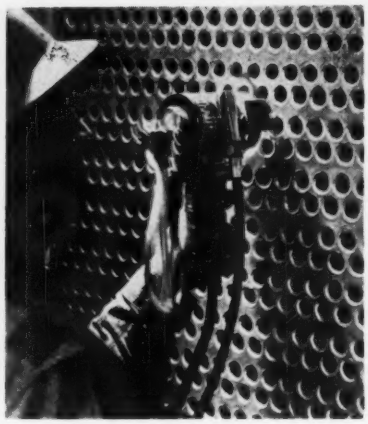
• • •

When you write us, we'll send you the whole story in a helpful booklet, and the name of our nearest Member. Call him, he will gladly suggest the best answer to your property protection problem.

Helpful booklet describes fence styles, gates and, components



PAGE FENCE ASSOCIATION
National Headquarters • Monessen, Pa.
A product of Page Steel & Wire Division American Chain & Cable Co., Inc.



Welded Tube Joints Used For Indian Point Plant

The new nuclear electric generating station of Consolidated Edison Co of New York, Inc, at Indian Point, will have pressure-tight joints of the tubes to the tube sheets in its steam condensers through the use of a lightweight, automatic welding gun developed by Revere Copper & Brass, Inc.

Because of the low chloride requirements for the secondary water system at Indian Point, it is vital that the two-shell, single-pass condensers be completely leak-proof. To achieve this, Con Edison specified welding of the condenser tubes to the tube sheets.

A permanent pressure-tight joint is effected by the Revere welding gun by means of a rotating tungsten electrode operating in an atmosphere of inert gas. Used on a special joint design, the new process makes it possible to weld without addition of filler metal to obtain a consistently high tensile weld strength.

The rotating mandrel of the Revere gun is inserted into the tube to be welded in such manner that the path of the torch and along the periphery of the tube is accurately maintained, despite any slight inaccuracies in tube-sheet drilling.

Rotation of the mandrel is accomplished by means of a flexible cable from a variable speed motor located at the power source. The torch is water-cooled and mounted to avoid tangling of gas and water hoses and electric cables.

Revere condenser tubes and tube sheets were used throughout for the construction of the condenser. A total of 31,508 30-ft tubes were used in the condenser, as well as 66,000 lb of tube sheets.

Equipment Mfrs Announced For APS 'Four Corners'

Line and terminal equipment manufacturers for Arizona Public Service Co's 300-mile 345-kv run from Four Corners Power Plant in northwestern New Mexico to Phoenix (see page 49) have been announced. To be accomplished jointly by Howard P. Foley Co and Telco, Inc, the line construction project reportedly will be supported by equipment manufacturers:

- American Bridge Div of US Steel —more than 1,600 steel towers
- Kaiser Aluminum—nearly 16 million lb of ACSR conductor
- Thomas & Betts—splices and deadends
- Locke Div of General Electric Co—insulators and hardware.

A separate contract covering a portion of the terminal equipment for the new Four Corners line was awarded by APS to General Electric Co. This contract covers four EHV power transformers and 14 reactors. Included are two 345-kv, 430,000-kva transmission-tie autotransformers. Also to be supplied by GE: A 345-kv, 370,000-kva transformer; a 345-kv, 140,000-kva unit; two 65,000-kva oil-immersed shunt reactors, and 12 single-phase concrete reactors.

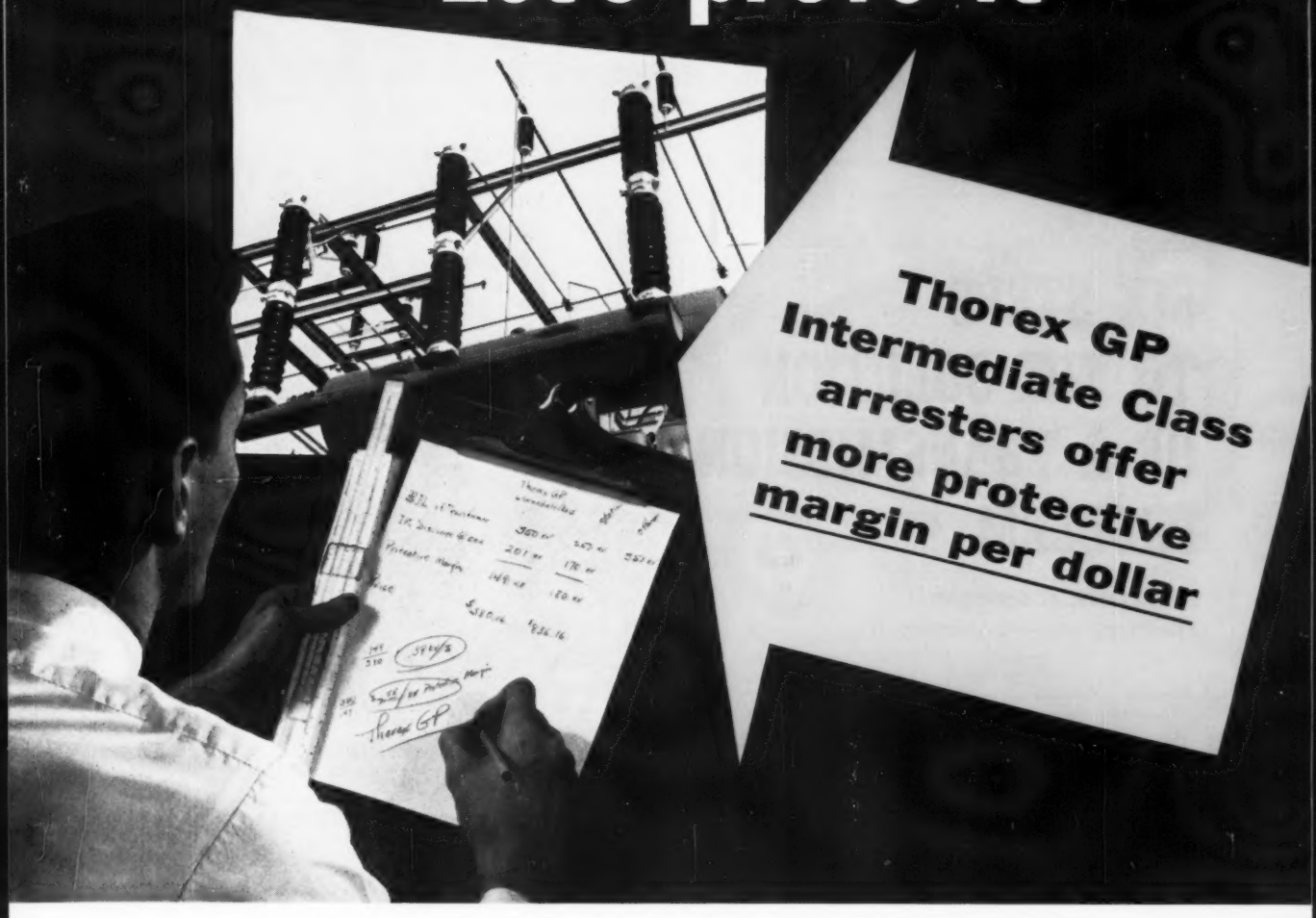
As EW goes to press, equipment and material cost figures pertinent to individual manufacturers are not available.

Alcan Agrees on A.B. Chance License

A licensing agreement in the United States for the manufacture and distribution of electrical conductor accessories designed by Aluminium Limited was announced today by the A. B. Chance Co, of Centralia, Mo., and Aluminum Limited Sales, Inc, the United States sales subsidiary of Aluminium Ltd.

Under the licensing agreement, Aluminum Co Ltd will supply Alcan designs and manufacturing techniques to A. B. Chance Co.

Let's prove it



These Thorex GP-73 (100% application) lightning arresters are applied to a 69-kv ungrounded neutral, 350-kv BIL transformer. At 5,000 amperes, the maximum IR discharge voltage is 201 kv, which provides 149 kv of protective margin. Divided by the price, this figures about .39 kv of protective margin per dollar . . . or $2.55 per kv of protective margin. Quite a bargain!

Now, you do some figuring. Compare these values with Station Class or any other Intermediate Class arrester for the same service. The catalogs on your desk probably have all the information you need. Be sure to run a comparison at your system voltage. Value of the Thorex GP will be evident.

This story of value doesn't end here. Besides its good protection, the Thorex GP Intermediate Class arrester excels in ability to withstand long duration surges. It exceeds by over three times the present ASA standard requirements for the heavy-duty *Station Class!*

If you are faced with the task of getting the most for your arrester dollar, this is an answer worth remembering: Dependable Thorex GP Intermediate Class arresters offer you more protective margin for each arrester dollar than any other arrester. You can easily get full information on the Thorex arrester for your application, just ask for it. Your O-B representative will be glad to help.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass HOLAN

PORCELAIN INSULATORS • LINE HARDWARE • CAPACITORS • LIGHTNING ARRESTERS
BUSHINGS • HOLAN TRUCK MOUNTED POWER DEVICES AND BODIES • BRONZE VALVES

10106-H

OHIO BRASS MANAGEMENT REPORT

SIX STEPS TO THE SOLUTION OF A TRANSMISSION PROBLEM

(plus a little Gamesmanship at Ohio Brass)

BY GEORGE L. DRAFFAN
CHAIRMAN, OHIO BRASS COMPANY

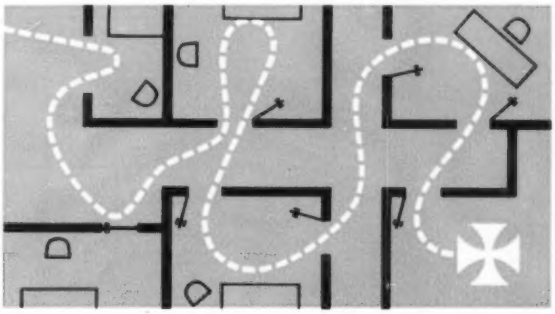
It's interesting to observe the ritual that is followed when a special transmission problem is presented to the people who run the O-B high voltage laboratory. Roughly, here's what happens:

FIRST STEP—Problem outlined . . . no reaction from the laboratory staff other than looks of skepticism.

SECOND STEP—Staff presents reasons why problem cannot be solved . . . our impulse generator isn't big enough (despite the fact it produces impulse waves as steep or steeper than any in the industry) . . . our measuring instruments aren't new enough . . . there's a shortage of personnel . . . and besides, there isn't enough time on the testing schedule.

THIRD STEP—Renewed plea to see what can be done . . . a good customer wants to know and the problem may have widespread bearing on several transmission lines now in the design stage.

FOURTH STEP—This might be called the gestation period . . . little indication of any real activity but a careful observer can see something is under way . . . certain pieces of key equipment are shifted in the laboratory yard . . . the big corner office door is closed and if someone has the audacity to enter, there's a flurry as sketches are quickly covered up. You get the feeling you are a spy trying to break into general headquarters just before D-day.



FIFTH STEP—Testing begins on a "limited basis" . . . "we really don't expect to get anything." We silently congratulate ourselves for this is a sure sign that results will be available soon. This is confirmed when laboratory personnel begin coming to work in mid-morning after all-night testing sessions. Even in tired eyes the gleam of triumph is unmistakable.

SIXTH STEP—Complete report is presented with a minimum of comment . . . "maybe you can use some of this."

We don't pretend things always turn out just this way, but there is a remarkable amount of realism in the brief story I've told. (I'm sure our Sales Manager would tell you he would be glad to eliminate the first four steps.)

What does it reveal? Even in our computer age, the attitude of people remains a great force. If they know the problem—even if it appears utterly unreasonable—they're willing to do their utmost to provide a solution.

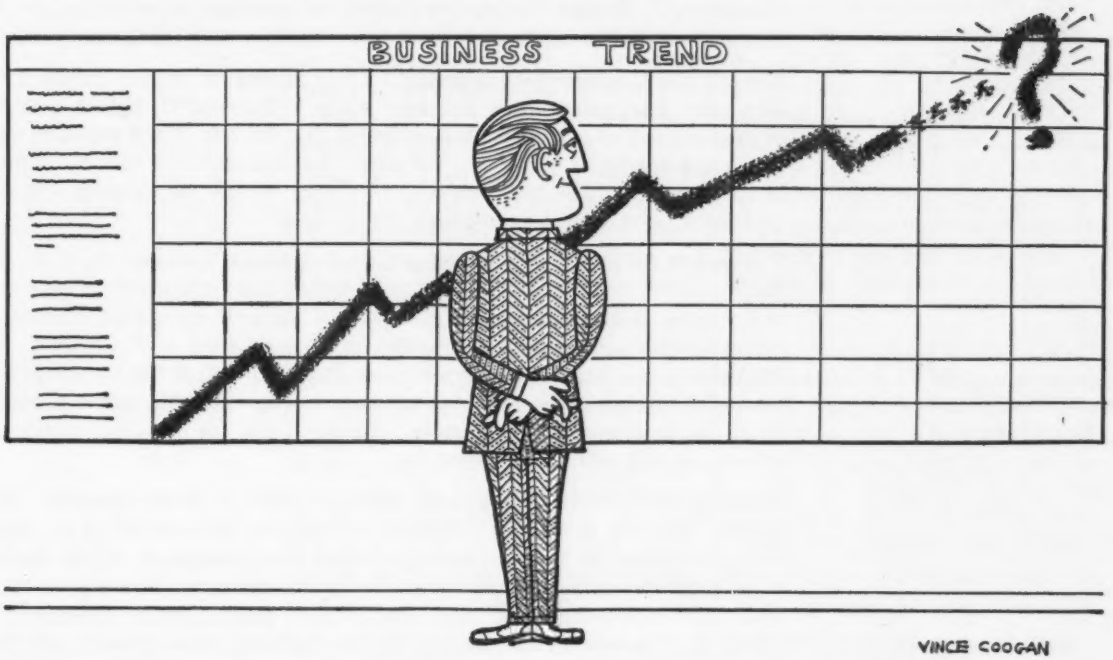
For a medium-sized company like Ohio Brass, there is considerable comfort in this idea. We know we can't always be competitive in the size of laboratory facilities or the number of technicians who man it. But as long as customers bring problems to us and as long as our people can respond to challenge in a creative way, I think we can be of real service to our industry. I hope you agree.

10148-H
OHIO BRASS COMPANY, MANSFIELD, OHIO
Porcelain Insulators – Line Hardware – Capacitors – Lightning Arresters Bushings – Holan Truck-Mounted Power Devices and Bodies – Bronze Valves

Electrical World

MAY 29, 1961

Management Newsletter



The Economy Is Climbing—But Will It Last?

Fourth Economic Conference of the National Industrial Conference Board in New York May 18-19 seemed like a good place to get a reading on what industrialists think of the nation's business picture. This proved to be true, but some of the conclusions derived are a bit blurred.

Three things stand out clearly, however. First, there's general agreement that the recession reached its bottom during the first quarter of this year, and that the economy is now in a healthy upswing. Second, there is some uncertainty as to just how long the upswing will last. Third, industrialists believe that the nation's plant is taking a terrific beating from inadequate depreciation allowances, and is rapidly becoming obsolete.

Dealing with the short-term economic outlook first, the prevailing optimism occasionally went so far as to indicate that the recovery is much stronger than many had anticipated earlier. This view was based on the great strength which is already apparent, and on the relatively high levels of business activity from which the upswing began. Here's how it looks to some segments of the business world.

Retailers generally expect a higher level of consumption and expenditures this year, with increases for soft goods and services more than offsetting the unchanged or slightly lower rate of consumer durables spending, according to John A. Barr, board chairman of Montgomery Ward & Co. Barr believes the upward trend in the economy should result in about a 3% increase in total retail sales for 1961.

This prediction is assuming a second half improvement in industrial production, inventory accumulations, personal income and consumer spending. Consumer spending, for commodities, however, could be reduced somewhat by a continuing rise in expenditures for services. Retailers also consider the credit picture to be in their favor because of a slowdown in installment debt last year, and the fact that the average consumer is not currently over-expended.

William W. Tongue, economist with Jewel Tea Co, makes a forecast of interest to electric utilities. He says spending on durable goods should step up sharply this fall, and the Christmas season will bring new records for sellers of general merchandise. Tongue reached new heights of optimism in predicting that the industrial production index would be at 118, and GNP at $550 billion in 1962.

The automobile industry sees an annual 2.8% increment rise in sales through 1970, with some years going higher and some lower. Sherwood H. Egbert, president of Studebaker-Packard Corp, also confirmed that the low of the recession came in the first quarter of 1961. An indication of optimism in the industry is found in his statement: "The auto industry, despite its wounds, is planning a healthy 14% increase in capital expenditures for the year."

The outlook for petroleum was among the less optimistic forecasts. L. F. McCollum, president of Continental Oil Co, indicated that production of petroleum was running at about two-thirds of capacity. Refinery operations, which have been cut sizably in the past few months, are now at about 80% capacity. Yet the industry still has an inventory of more than 316 million barrels which Continental Oil feels is 15% over what would be ample. For this reason, there will be no increase in outlays for drilling operations this year, and the increase in refinery capacity will be less than 1%.

Chemicals will continue to be a leader among the nation's growth industries. Hans Stauffer, president of Stauffer Chemical Co, reminded the audience of the industry's giant outlays for new facilities and research and development. It will continue to be a growth industry, Stauffer said, but all its segments will not grow at the same rate. Heavy chemicals, which usually follow general manufacturing activity, should increase sales by 2 or 3% over 1960. Synthetic resins, plastics, and fibers will record 4 to 5% sales increase. Synthetic organic chemicals for dyes, pharmaceuticals, synthetic resins and agricultural chemicals may be up as much as 10%. Industrial gas sales have increased sharply in recent years, and 1961 demand may exceed the prior years by 10%.

Republic Steel President T. F. Patton was among the more optimistic speakers at the conference. Steel ingot production hit its low in December at about 1.35 million tons a week, he said. But by April the weekly figure had come up to 1.75 million tons and the present weekly rate is about 2 million tons. On a quarterly basis, the first quarter was 4% better than the fourth quarter of '60, and the current second quarter may be 20 to 25% better than the first. These figures lead to a forecast of 100 million ingot tons of steel for 1961, compared with 99 million in 1960 and 117 million in the record year of 1955. Even more encouraging was the forecast for the 12-month period July 1961 to June 1962. For this stretch, Patton estimated total steel production would come very close to the 1955 record.

Short-term outlook for the construction industry was moderately optimistic. H. C. Turner, president of Turner Construction Co, made it clear that his optimism was not based on present figures. Construction put in place has been running on at an approximately even basis for the past two years with commercial, industrial, and public construction showing sufficient improvement to offset the decrease in residential building. The mild glow of optimism is in the area of construction planning. Turner has noticed a decided increase in planning which should shortly be reflected in new contract awards, and which will turn into actual construction activity a little over a year from now. There's also encouragement for the industry in the Administration's plans for stepped-up public construction, particularly in a vigorous highway program.

Disagreement arose over the future of residential housing. There was some feeling that housing starts would respond to the greater availability of mortgage money, and were due for a sizable upturn. But neither Turner, nor Norman Robertson, manager of economic studies for American Radiator & Standard Sanitary Corp, expected any sharp upturn. Both felt the problems of residential housing went much deeper than availability of mortgage money. Robertson estimated that at best, housing starts can be expected to reach 1.3 million units annually by the end of the year, but he expressed the opinion that this was a healthy rate.

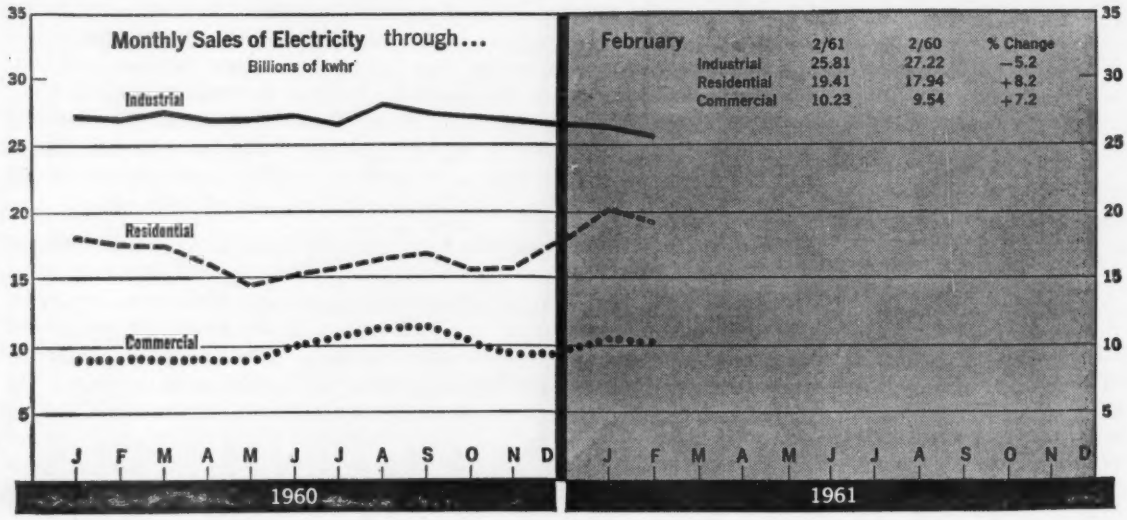
Troubles in the machinery industry were traced by R. S. Stevenson, president of Allis-Chalmers Manufacturing Co. Stevenson divided the field into four areas: agricultural machinery, construction machinery, electrical machinery, and industrial equipment. A steady and slow advance is in the future for agricultural machinery, Stevenson said. Construction machinery sales are heavily dependent on government programs for highways, dams, and other public projects. The reduction in highway outlays was a major cause of lower sales in 1960, and the step-up in this activity by the new Administration is highly encouraging. Manufacturers of electrical equipment can count on selling about 5% more in dollar volume in 1961 over 1960. Capital equipment purchases are likely to be slightly ahead of last year, Stevenson pointed out, "however, it will take an increase in sales volume of 7 to 8% in the last half of the year to offset the deficit recorded in the first half."

But the optimism waned considerably when the discussion shifted from the short-term outlook to the future in general. Speakers were not at all certain as to just how long the upswing would last. George P. Hitchings, vice president of economic research at American Airlines Inc, felt that the future was sound. Hitchings tended to discount the shortness of the business boom following the 1958 recession. Consumer spending for soft goods and services during the past decade has risen 40% despite the peaks and troughs, and will jump another 40% in the next ten years, he said. The same kind of trend line can also be traced through the fluctuations in durable goods. Even with the current slack, durables have grown 40% through the '50's and will show the same increase in the '60's.

Far less enthused over the future was Dr V. L. Bassie of the University of Illinois. Dr Bassie expressed the Keynesian viewpoint that investment is the key to growth. He pointed to the tremendous gap between capacity and present operations which offered business no real incentive to invest. This situation means a slack capital goods industry for some time to come. Only when demand catches up with capacity will the slackness of investment end, he insisted, and only then will we have real growth.

There was, however, unanimous agreement on one point. America's plant is growing obsolete, and the government must do something about our present inadequate depreciation laws in order to correct this situation. S. H. Egbert, president of Studebaker-Packard Corp, pointed out that during a recent trip through Europe he had seen some of the Continent's new production facilities in operation. They're the cleanest plants he has seen, he told the audience, far more modern and more highly automated than anything we've got in America. Other speakers shared Egbert's concern. During Europe's present boom, even these plants are not adequate to meet the Continent's own needs. And as long as this situation continues, there won't be too great a threat from foreign competition. But when European capacity edges past local demand, and these modern factories begin exporting at a larger scale, very few existing American facilities will be able to match their efficiency.

Martin R. Gainsbrugh, chief economist for the Conference Board, polled one panel for a solution to this problem. To a man they agreed that the President's proposed tax credit for new investment was not enough. What is needed is to allow American firms to write-off capital expenditures on a straight-line method over a very short period. This is what they're doing in Europe, and we've got to do it here if we are going to compete successfully with European manufacturers in the world market, panel members agreed.



Power Statistics

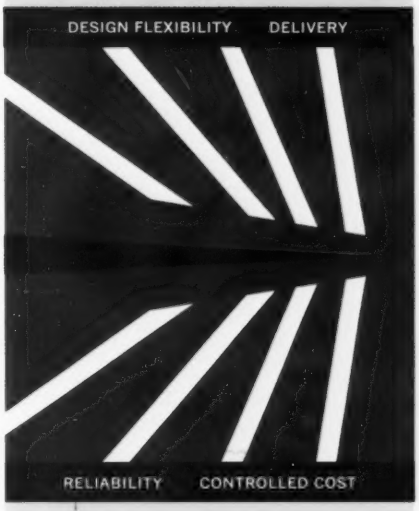
		Latest Month	Year Ago	Annual Change %
Capacity	Feb.	167.90	158.22	6.1
Est. Dec. '60 Peak (million kw)	Nov.	133.7	134.0	−0.2
Est. Dec. '61 Peak	Feb.	140.6	144.1	−2.4
Production—billion kwhr	Feb.	59.26	60.33	−1.8
Hydro		10.24	12.52	−18.2
Fuel		49.02	47.81	2.5
Sales—billion kwhr	Feb.	58.22	57.19	1.8
Residential		19.41	17.94	8.2
Commercial		10.23	9.54	7.2
Industrial		25.81	27.22	−5.2
Other		2.77	2.50	10.8
Fuel Consumption	Feb.			
Coal—million tons		14.94	15.22	−1.8
Oil—million barrels		7.59	8.52	−10.9
Gas—billion cu ft		110.84	98.40	12.6
Net Income Class A & B Co's—$ million	Feb.	188.04	170.36	10.4
Residential Customers—millions	12 mos.	51.24	50.47	1.5
Revenue per kwhr	ended	2.46¢	2.50¢	−1.6
Avg kwhr per customer	Feb. 28	3,891	3,654	6.5
Avg annual bill		$95.72	$91.35	4.8

Business Statistics

Indexes:				
FRB Industrial Production (1957 = 100)	Apr.	106	110	−3.6
ENR Construction Cost (1949 = 100)	May	177.6	171.9	3.3
BLS Cost-of-living (1947–49) = 100)	Mar.	127.5	125.7	1.4
New Orders for Machinery (1950 = 100)	Mar.	185	189	−2.1
NEMA Sales				
Insulation materials	Mar.	144	168	−14.3
Electric appliances	Feb.	84.6	94.3	−10.3
GNP—annual rate—$billion	4th qtr.	503.5	486.4	3.5

Significant Changes: FRB index climbs from March's 104 level to 106 in April. Index of new machinery orders jumps from 168 in February all the way to 185 for March.

Westinghouse conquers four barriers to economical superload growth



From 160 million kw today to more than 600 million kw in 1980—this is the challenge to America's electric utilities if they are to meet the needs of a mushrooming population and economy.

By 1980, yearly additions alone will equal approximately all the generating capacity installed throughout the first 40 years of this century. Thus, building more and larger machines with controlled costs becomes one of the industry's biggest problems.

Through continuing research and development, Westinghouse is finding answers which can help you plan now to meet future power needs economically.

Westinghouse

the need . . . bigger, more complex units with high temperatures and pressures

CERTAIN TRENDS ARE EVIDENT NOW. . .

- Maximum unit sizes—presently 500 mw for single shaft and 1,000 mw for double shaft—are expected to reach 650 mw for the former, and a possible 1250 mw for the latter. Other designs now being studied make even higher ratings feasible.
- In 1980, the number of units built per year will increase more than 15% over the number built in 1960, and large unit design will change from tandem-compound two-, three- and four-flow to cross-compound two-, four- and eight-flow.
- The number of turbine elements required for these complex machines will increase by 50% every 10 years.
- The increasing number and complexity of machines will probably triple the engineering effort needed to build them by 1980.
- Steam conditions—temperatures and pressures—as high as 6000 psi at 1200°F are possible.

These anticipated generating conditions, through which the huge power demands will have to be met, present economic problems which might, at first glance, seem insurmountable.

IN ORDER TO MEET FUTURE POWER NEEDS ECONOMICALLY, MANUFACTURERS OF GENERATING EQUIPMENT WILL HAVE TO . . .

1. Achieve design flexibility, superior engineering and improved manufacturing techniques for a wide range of turbine designs.

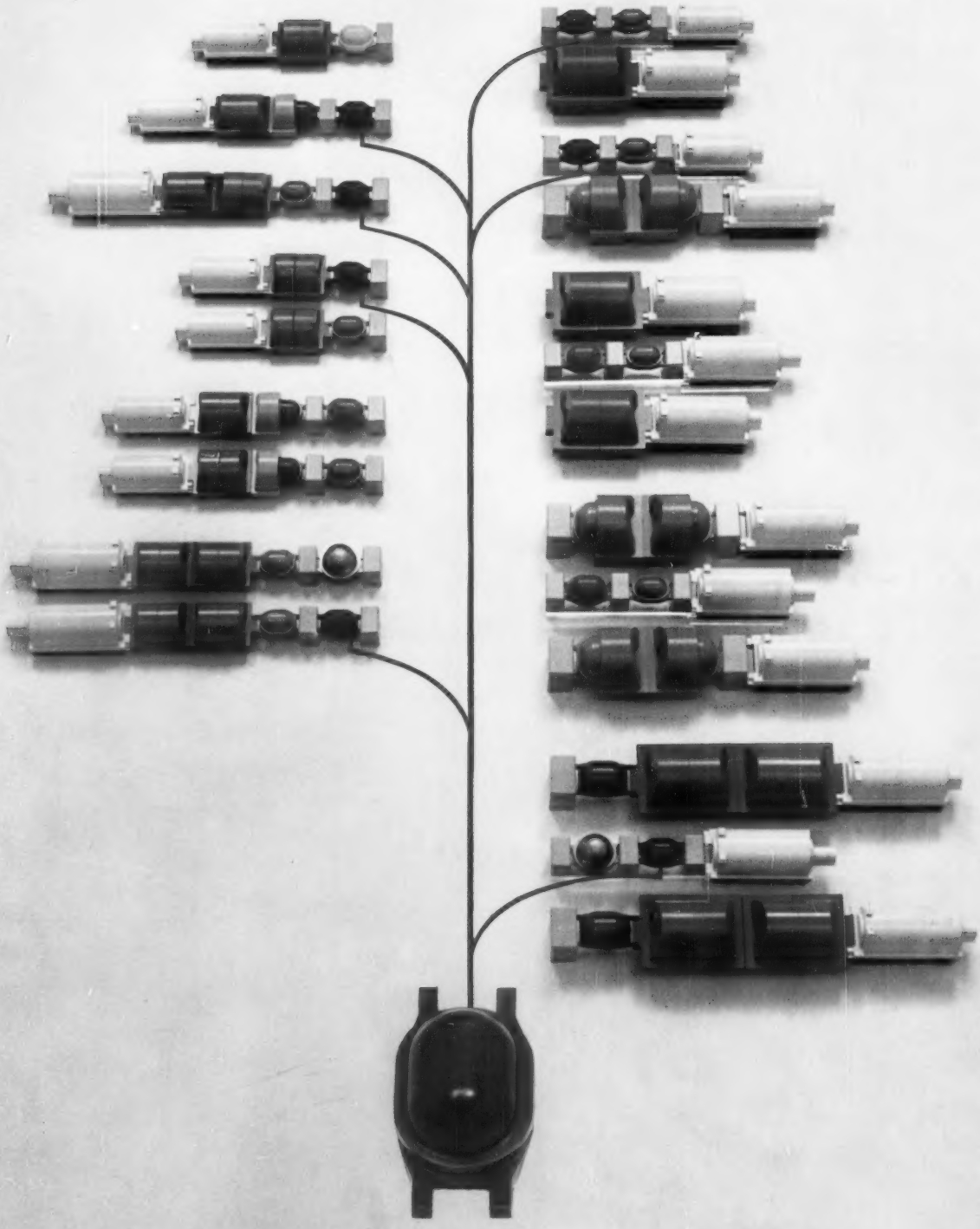
2. Provide shorter schedules for engineering data, for plant studies and for delivery of equipment.

3. Design and build high reliability machines.

4. Control costs while unit sizes and complexities increase.

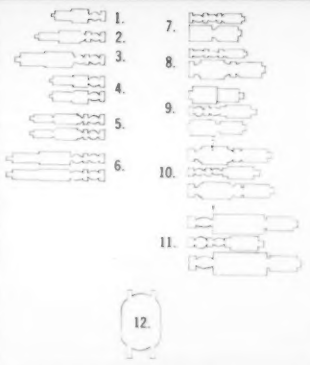
Westinghouse, builder of the world's largest tandem-compound turbine-generators, now offers a solution to the economic problems of designing and building this superload growth equipment—the principle of *integrated components*.

Westinghouse



integrated components save time, man power, money . . . give you design flexibility

Westinghouse



3600 RPM

1. Tandem-compound two-flow
2. Tandem-compound three-flow
3. Tandem-compound four-flow
4. Cross-compound four-flow
5. Cross-compound six-flow
6. Cross-compound eight-flow

3600/1800 RPM

7. Cross-compound two-flow (single case LP)
8. Cross-compound two-flow (two case LP)
9. Triple shaft cross-compound four-flow (single case LP)
10. Triple shaft cross-compound four-flow (two case LP)
11. Triple shaft cross-compound eight-flow
12. High pressure element

Since time is a critical factor in meeting future power needs economically, the possibility of using turbine element similarities (the philosophy of interchangeability) wherever efficiently and economically practical offered a natural solution to Westinghouse designers.

After careful study of the types of machines needed in the future, Westinghouse engineers noted that any type could be built from a combination of basic elements.

Combinations of 3600- and 1800-rpm elements (see opposite page and above) can be arranged to produce single, double and triple shaft units. 3600-rpm elements can be made up in tandem-compound two-, three- and four-flow machines and in cross-compound four-, six- and eight-flow machines. Increased ratings can be produced by adding higher pressure and temperature front ends to a combination of the elements that make up the basic machine arrangements.

MANY BENEFITS

By utilizing the interchangeability of these elements, Westinghouse can deliver top efficiency in the shortest time.

- Unnecessary repetition of design and manufacturing engineering is eliminated.
- Machines can be designed and built more quickly.
- Reliability is increased through specialized and concentrated manufacturing experience.
- Costs are controlled—only design modification of elements is necessary.
- Creative man power is freed from solving repetitive problems to develop greater advances and efficiencies.

Coupling these factors with a more uniform heat balance arrangement and basic plant design practice permits the utility to have a well-planned program for adding huge blocks of capacity with a maximum of economy, at highest efficiency.

This typical Westinghouse unit uses advanced design integrated components. With a capacity of 325 mw, this 3600-rpm tandem-compound, four-flow, reheat turbine utilizes an opposed-flow high pressure element, a double-flow intermediate pressure element, and two double-flow low pressure elements. These same elements can be used to build a cross-compound four-flow unit.

integrated components lead to greater generator requirements

YET WESTINGHOUSE IS ABLE TO MATCH GENERATORS TO ANY TURBINE OF THE FUTURE

Current research into metals, new excitation systems, and many other advanced materials and methods, makes it possible *now* for Westinghouse to build generators for any turbine of the future. Two basic breakthroughs—Inner-Cooling and Thermalastic®—have been responsible for today's high capacities, and have opened the door to tremendous future developments.

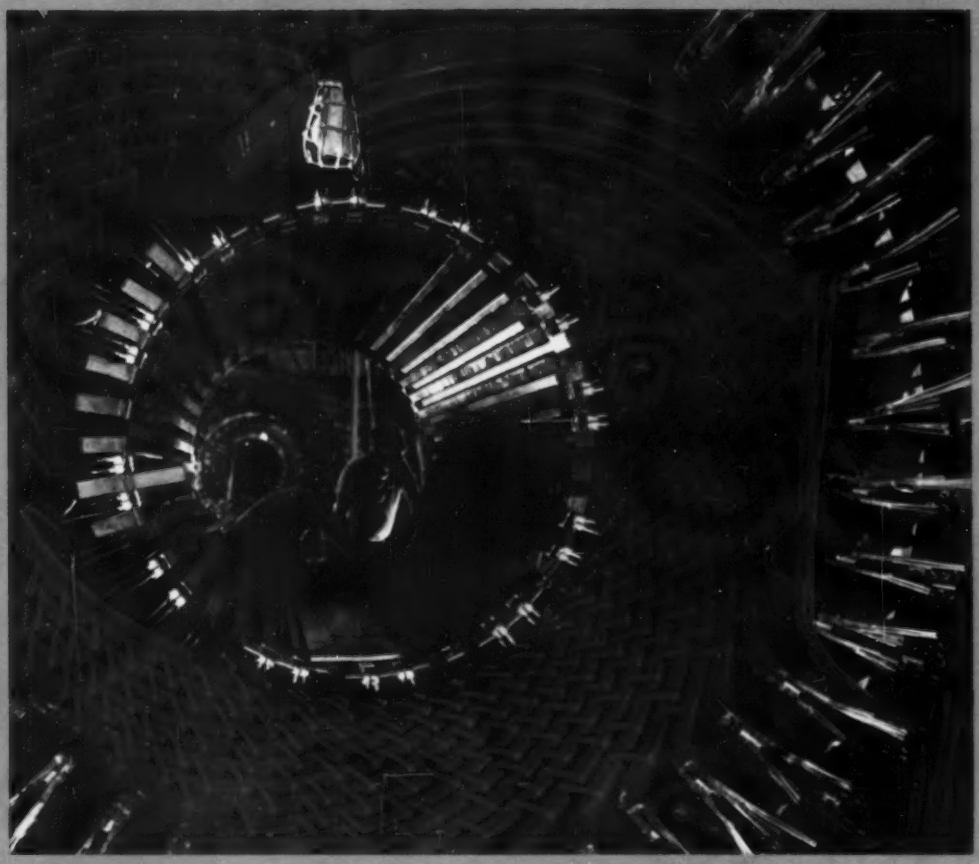
PRESENT DEVELOPMENTS LEAD TO HIGHER CAPACITIES, LOWER MAINTENANCE

The search for better steels, particularly forgings, is resulting in the development of new alloys and compositions to give maximum strength with suitable ductility. Westinghouse scientists, working with forging suppliers, have developed advancements in forging techniques. Vacuum pouring, for example, excludes hydrogen and other gases and results in improved forging quality.

Other projects include research into impurities, electrical sheet steel with better magnetic properties in all directions, even better Thermalastic Insulation, new ideas in excitation systems and a host of other developments.

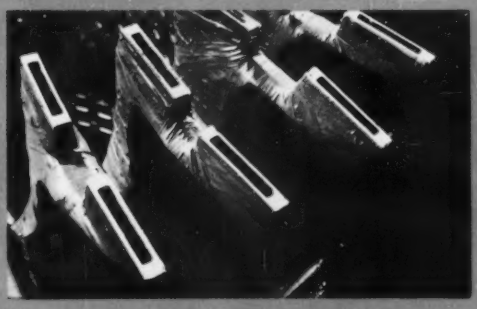
Westinghouse research and development will prove vital in helping you meet *your* future power needs economically.

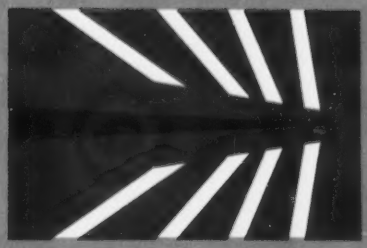
Westinghouse



Inner-Cooling, developed by Westinghouse and now a standard feature of all Westinghouse generators 160,000 kva and above, circulates hydrogen through the rotor and stator windings, providing intimate contact with the conductors where heat originates. Inner-Cooling allows ratings of single shaft units to triple over conventionally cooled units and greatly reduces size and weight of equipment.

Thermalastic Insulation — the "insulation with a memory"—has a unique molecular structure which permits expansion and contraction of the windings without injurious deformation throughout the life of the machine. Operating voltages cannot get through the fish-scale barrier of mica splittings, which are locked in a memory-type elastic bond.



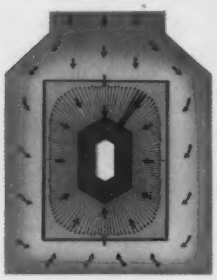


condenser design flexibility means highest efficiency with any combination of turbine elements

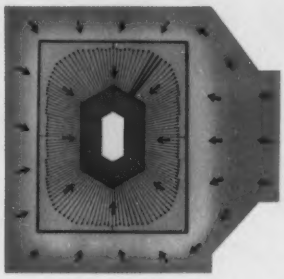
EXPERIENCE AND COMPLETE LINE OF AUXILIARIES PERMIT BEST DESIGN AT LOWEST COST

The design flexibility of Westinghouse condensers makes it possible even today to fit them to tomorrow's turbine-generator units with maximum efficiency.

Westinghouse condensers are readily adaptable to any turbine exhaust configuration. Exclusive Radial Flow Design permits the exhaust steam to completely envelope the tube bundles at any point of steam inlet.

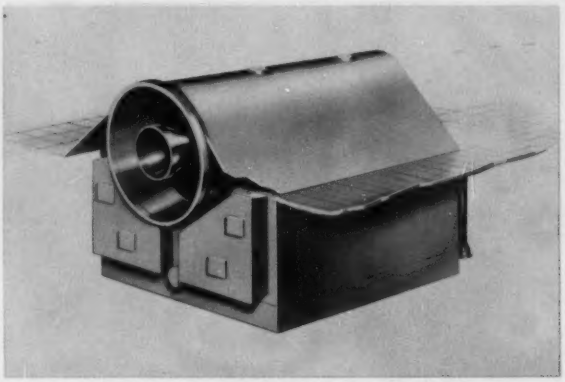


Down Flow



Side Flow

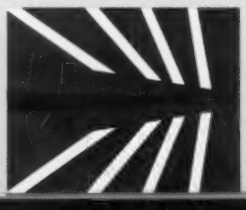
This adaptability, plus a wide range of pumps and auxiliaries, allows for a unified design that gives the highest efficiencies at the lowest cost in a variety of differing installation requirements.



This artist's conception shows an Axial Flow Condenser designed for a large, low-headroom plant. The Radial Flow principle allows for excellent steam distribution for all types of turbine installations.

Research for the future is proceeding in heat transfer apparatus as well as in turbines and generators. For more information, contact your Westinghouse Representative. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

You can be sure . . . if it's **Westinghouse**

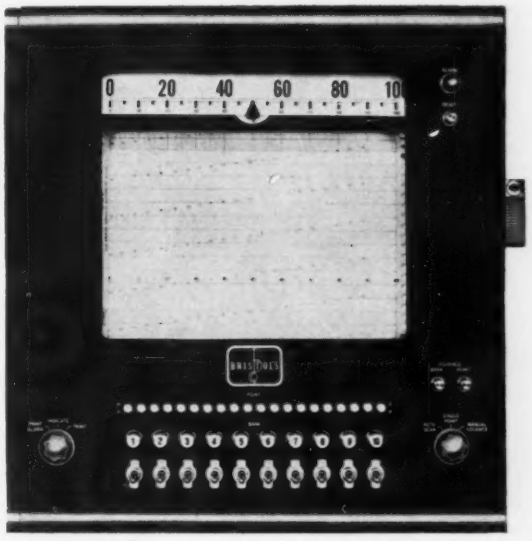


LITHO IN U.S.A.

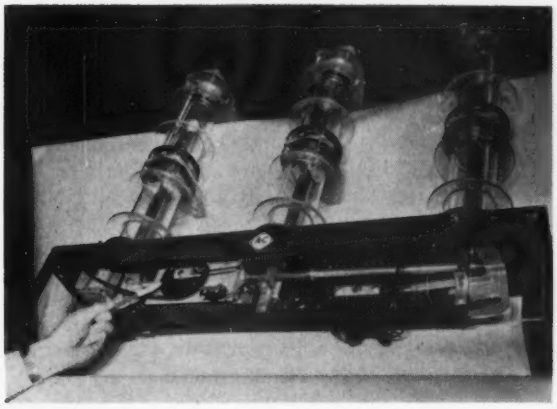
JI-50610-R1

New Equipment

Alarm Scanner . . .



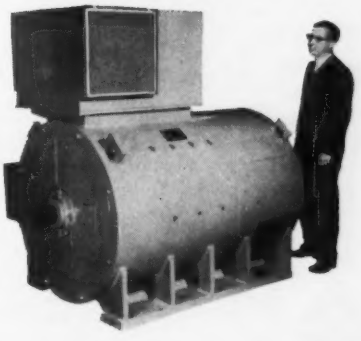
. . . scans up to 200 measured variables at rate of one point per sec. Upon discovery of any off-normal situation, the instrument activates a recorder (which records alarm condition measurement, reporting exact location); actuates red alarm lamp, and energizes any desired external alarm system. Then the instrument returns to normal scanning, leaving the alarm lamp on until a reset button is depressed. Recorder is energized only when alarm condition is discovered. A screwdriver adjustment on the readily accessible potentiometer sets alarm condition for 20 points at a time to a maximum of 200 points. Lamp banks on instrument face permit operator to follow the scan cycle point-by-point, or manually adjust to single-point scanning or recording.
Bristol Co, Waterbury 20, Pa.



Capacitor Vacuum Switch...

. . . has motorized operator, which requires considerably less control power than optional solenoid operator previously offered with this switch, Type VSC (EW, May 9, 1960). Operator for the 3-phase, 15-kv, 300-amp switch is powered from 115 v ac, 125 v dc, 230 v ac, or 250 v dc. Its motor draws 0.2 to 0.8 amp. Switch, designed to interrupt all phases simultaneously under all weather conditions, has sealed vacuum interrupter. Its four auxiliary contacts are said to withstand thousands of operations. Operator housing accommodates eight auxiliary switches.
Allis-Chalmers Mfg Co, Milwaukee 1, Wis.

Generator Frame . . .

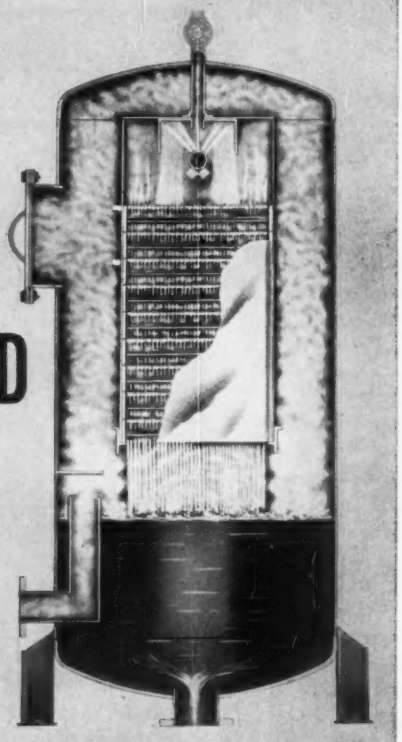


. . . reduces inertia for faster response, through lengthened armature and decreased armature diameter. Type SK, (dia 190) for larger dc motors and for generators, also said to have improved insulation and commutation, as well as increased mechanical stability for lower vibration. Typical machine ratings are 500 hp at 850 rpm, 240-v dripproof enclosure; 800 hp at 1,150 rpm, 600-v force-ventilated for heavy industrial applications. Corresponding generator ratings with dripproof construction are 480 kw at 850 rpm for 250-v dc power supply. Ribbed construction at frame's base gives self-supporting prealigned rigidity. Weight and floor space required are reduced by use of brackets and ball bearings. Supplementary compensating field windings are available as required.
Westinghouse Electric Co, Box 2099, Pittsburgh 30, Pa.

FLUIDICS* AT WORK

.005 ml/l OXYGEN GUARANTEED

by this new Permutit® Tray Deaerator



The picture above illustrates the new Permutit Tray Deaerator, which is *guaranteed* to reduce oxygen to .005 ml/l, or less, and to remove all the free CO_2.

This sectioned illustration shows the stainless steel trays and inner chamber. Steam passes upward through them, while the water spills down from tier to tier, constantly being exposed to the steam until, fully deaerated, it reaches the reservoir at the bottom.

The highest temperature incoming steam contacts this final deaerated water. It is also the purest, oxygen-free steam, and as it sweeps upward it takes to the vent all the freed corrosive gases.

The highly efficient internal vent condenser saves B.T.U.'s by reducing vented steam to a negligible wisp which is just enough to carry off all the non-condensable gases.

Guaranteed Water

These and the other design aspects of the Permutit Tray Deaerator enable us to give you a *guarantee* that you'll always get feedwater with (a) less than .005 ml of oxygen per liter of water, and (b) no titratable free CO_2.

And just off the presses is our Bulletin 4732, containing information on the construction details, operation, and other advantages of the Permutit Tray Deaerator. Send for a copy.

Permutit Division, Dept. EW-51, 50 West 44th Street, New York 36, N. Y. In Canada, The Permutit Company of Canada, Ltd., 207 Queen's Quay West, Toronto 1, Ontario.

*FLUIDICS is the Pfaudler Permutit program that integrates knowledge, equipment and experience in solving problems involving fluids.

PFAUDLER PERMUTIT INC.

Specialists in FLUIDICS . . . the science of fluid processes

Selling

Commercial electric cooking school for electric utility commercial salesmen has been planned by Edison Electric Institute. The school will be held June 19-23 at the Culinary Institute of America, New Haven, Conn. Purpose of the workshop is to provide utility sales personnel with an understanding of cooking fundamentals and to familiarize salesmen with products and service. For information contact: J. Dudley Waldner, EEI, 750 Third Avenue, New York 17, N. Y. . . . **Duke Power Co** has expanded its Housepower Panel Plan to include residential customers requiring up to 400-amp service entrances. Extension was made possible because of the larger size panels now available from manufacturers.

Attempt by Peoria, Ill., appliance dealer Horace W. Staats to put electric utilities out of the appliance merchandising business in Illinois was defeated in Illinois Senate's Public Utilities Committee. That body voted down a bill which would have kept utilities from selling appliances and would have required them to advertise for bids for service lines into homes or businesses . . . **Outdoor lighting service** for farms, homes, churches and schools in unincorporated areas where street lighting is not available is being offered by Alabama Power Co. For $3.00 a month a mercury-vapor lighting unit, which is cut on at dusk and off at dawn by a photoelectric cell, will be installed on an existing company utility pole. An additional on a monthly charge is made if a pole has to be set.

Quick-recovery water heaters will now come under Pennsylvania Power & Light Co's 1¢ per kwhr residential water heating rate . . . **European-type** "arcade" street lighting standards will be installed on several Seattle, Wash., streets. The standards, arched aluminum poles spanning the street, reportedly have never been used in the United States before . . . **Revised minimum** Medallion Home standards have been published by the National Electrical Manufacturers Assn. Main change is the inclusion of multi-family dwellings.

IN U.S.A. A model of the runner for one of the eight 90,300 h.p. propeller turbines to operate at a head of 67 feet. These are being built in Canada for Big Bend Reservoir, South Dakota.

Power from 'Muddy Waters'

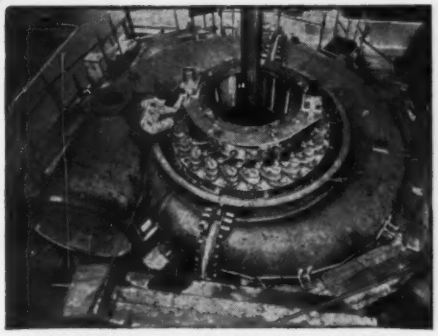
In the land of the old Dakotas (one of the confederated tribes of the powerful Sioux) rises a new dam at Big Bend Reservoir on the Missouri River whose yellow flow near its mouth gave rise to its name, 'Muddy Waters'.

Harnessed by the U.S. Army Corps of Engineers, these waters will provide electric power for the development of industry and agriculture throughout South Dakota and other states in the Missouri River Basin.

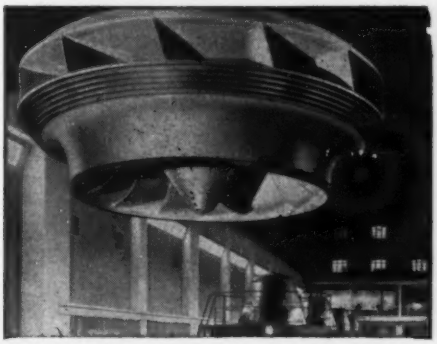
Eight propeller water turbines for this project are now being built in Canada to 'ENGLISH ELECTRIC' designs by John Inglis Co. of Toronto, a member of the world-wide 'ENGLISH ELECTRIC' Group of Companies.

Amongst the notable hydro power stations in North America equipped by 'ENGLISH ELECTRIC' are Beauharnois No. 3 and Robert H. Saunders on the St. Lawrence; Priest Rapids and McNary on the Columbia; Table Rock on the White River, Missouri; Chute-des-Passes and Bersimis in Quebec; and the Canadian Niagara pumped-storage station.

With factories in five continents, the Group is near at hand to any undertaking needing power engineering and can provide anything from a small individual drive to a comprehensive scheme with generating plant using steam, water, gas, oil or atomic energy.



IN WALES Works assembly of one of four 105,000 h.p. Francis turbines for a head of 970 feet, to be installed at Ffestiniog Pumped-Storage Station.



IN AUSTRALIA. Four high-head Francis turbines and a spare runner supplied to the Tumut 1 Station, Snowy Mountains. These turbines, which can deliver 129,000 h.p. at 1,065 feet head, are amongst the most powerful at this head in the world.

'ENGLISH ELECTRIC'

Agents: ENGLISH ELECTRIC CORPORATION, 750 Third Avenue, New York 17, N.Y. Telephone: MURRAY HILL 7-0303

Sub-Agents

FOR WASHINGTON AND OREGON — James I. Metcalf & Co., Inc., Room 704, 1411 Fourth Avenue, Seattle 1, Washington. Tel: MAin 4-6322

FOR GEORGIA, ALABAMA, TENNESSEE AND SOUTH CAROLINA — Osgood & Associates, Inc., 988 Spring Street N.W., P.O. Box 7383, Station C, Atlanta, Georgia. Tel: TRinity 5-7804/5

FOR MASSACHUSETTS, RHODE ISLAND, MAINE, NEW HAMPSHIRE AND VERMONT — Flagg, Brackett & Durgin, Inc., 183 Essex Street, Boston 11, Massachusetts. Tel: HUbbard 2-4120

FOR SOUTHERN FLORIDA — Charles R. Lee & Associates, Inc., 3796 West Flagler Street, Miami 44, Florida. Tel: HIghland 4-7414

OC/US/10

To insure fail-proof multiple lighting control

There's nothing untried, no lack of field proof when you install Precision photocontrols. Major utilities—with hundreds of thousands of installations—have proved Precision's reliability on their lines for more than 4 years.

The reasons? Precision is *simply* the best-engineered, best-built tubeless photocontrol at any price. Because it pioneered tubeless lighting control, it gives you more proven performance on all installations — 500-watt farmyard lighting to 3000-watt white-ways.

Advanced engineering Precision embodies 2 time-proven components — a wide-area cadmium sulfide cell directly regulating a long-life integrating relay. No capacitors, rectifiers, sensing leads or tubes to "fail out" in Precision. Other control circuits need up to 18 such fragile components.

On-the-lines dependability Inconspicuous transparent housing gives *total area exposure* to light sensing cell. No shading, no shielding in Precision to overload cells or intrude upon "human eye" responsiveness. Calibrations are made directly on the switch for light levels 0.5 to 10 ft. candles. Housing admits light freely but is impervious to dirt, insects, moisture. Precision uses a 1-watt cell for long life. Its conservative rating never is exceeded in operation.

System-wide versatility Precision controls, guaranteed for 2 years, can be used interchangeably on every pole. Model D-2-275 conforms precisely with EEI-NEMA standards for locking-type controls. Its full-visibility housing, with molded index marks, simplifies North orientation for system-wide uniformity and makes it the easiest of all controls to "sight" wherever local light levels demand special consideration. Model D-2-375, with 3¾" ID, puts modern control on older poles. Model D-5 fits standard watt-hour meter base and 22 adaptors and mountings make *one* control — Precision — the only control you need to stock for your entire multiple system.

Technical data on Precision are summarized below for your quick reference guidance in extending your automated multiple lighting systems with insured dependability. Precision welcomes comparative appraisal — in your labs and on your lines — with the performance of any other device for lighting control at any price.

Model	Supply voltage*	Type of switch	Load rating in volt/amps	Means of attachment
D-2-275	105/130	SPST	1800	Locking-type
D-2-375	105/130	SPST	1800	Locking-type
D-4-275	210/250	SPST	1500	Locking-type
D-4-375	210/250	SPST	1500	Locking-type
D-5	105/130	SPST	3000	Meter base
D-6	210/250	SPST	3000	Meter base
D-7	105/130	SPST	3000	Meter base

All Precision controls have Normally Closed contacts at night. Controls with contacts Normally Closed **during the day** will be furnished on specification.
D-2-275 and D-4-275, 2¾" I.D. D-2-375 and D-4-375, 3¾" I.D. *25/100 cycles, AC

Operating data on locking-type models

Inrush current rating: 120 amps at 120V; 60 amps at 240V
Time delay: Minimum 15 seconds
Temperature range: —40°F to +170°F (—40°C to +77°C)
Power consumption: Less than 1.4 watts average

Operating levels: 0.5 to 10 ft. candles, or higher as specified
Standard turn ON: 1.5 ft. candles
turn OFF: 0.5 to 1.5 ft. candles higher than turn ON
Lightning arrestor: Gap type, with 25,000 amp surge current capacity; 2000V impulse spark over.

Field service, on any aspect of Precision-controlled lighting, is immediately available from Precision engineering representatives in more than 50 U.S. and Canadian cities.

Write or wire for cost-saving quotations:

PRECISION MULTIPLE CONTROLS, INC. • Ridgewood, New Jersey

The difference between night and day

specify Precision Model D-2-275, pace-setter among all EEI-NEMA standard photocontrols

Model D-2-275 is shown approximately 2½ times actual size.

News About People

Two Vice Presidents Are Picked at Georgia Power

SHADGETT BURTON

L. M. Shadgett has been elected vice president and assistant general manager of Georgia Power Co. Ben W. Burton was chosen to succeed Shadgett as vice president and Athens division manager.

Shadgett has been with Georgia Power since 1928. He became Athens division manager in 1937 and was named a vice president in 1940.

Burton joined Georgia Power as a field engineer in 1937. He was most recently Athens division superintendent.

McCARTHY ▶

McCarthy Becomes Vice President

Kansas City Power & Light Co has boosted William C. McCarthy to a vice presidency.

McCarthy has been heading the rate department as manager of rates since 1959. He was also assistant secretary-treasurer for the utility.

McCarthy joined Kansas City P&L in 1934 as an engineer.

Kennedy Steps Into West Texas Utilities Vice Presidency

A 27-year veteran of West Texas Utilities Co and manager of its public service department since 1956, Robert E. Kennedy has been named a vice president.

Kennedy has been with West Texas on a full-time basis since 1934 (he was previously a part-time mail clerk in the company's treasury department). He came up through the ranks and was chosen manager of the public service department when it was formed.

◀ KENNEDY

Arkansas-Missouri Power Boosts Newcomb to Vice President

NEWCOMB ▶

Charles R. Newcomb has been promoted to vice president of Arkansas-Missouri Power Co. Franklin E. Atkinson was elevated from auditor and assistant secretary to treasurer.

Newcomb, who has been secretary and treasurer since 1938, will continue to serve as secretary. Atkinson will continue as assistant secretary in addition to his new duties as treasurer.

(*More News About People on page* 96)

Communication Cable
that cuts installation time

in half!

SUPERIOR

I. M. CABLE

Cable messenger is firmly gripped between jaws of Tangent Support

- **Needs no separate messenger**
- **Requires no special hardware**

When you install SUPERIOR I. M. Cable, the need for spinning or supporting the cable to a separate messenger is completely eliminated!

Choose the core construction you need with color-coded plastic insulated conductors and longitudinally applied corrugated aluminum or copper shielding over the core tape . . . sizes 6, 12, 18, 25, 50, 75 and 100 pairs in 22, 19, and 16 gauge soft-drawn copper. Cable exceeds current industry specifications.

The messenger is impregnated with a corrosion-proofing thermoplastic compound which becomes an integral part of the cable configuration during the jacketing operation. Breaking strength exceeds 6000 pounds. Can be gripped, pulled and tensioned using standard techniques.

A high molecular weight polyethylene jacket is extruded over both core and messenger.

Install SUPERIOR I. M. Cable, supported communication cable, and save time and money!

For complete information and prices, write

SUPERIOR CABLE

SUPERIOR CABLE CORPORATION, HICKORY, NORTH CAROLINA

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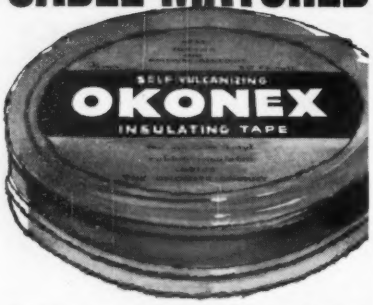
CABLE-MATCHED



OKONEX tape matches butyl-base rubber insulated cables . . . is heat, corona and moisture-resistant . . . gives a splice that lasts the life of the cable.

Other cable-matched Okonite tapes:

OKONITE—for mineral-base rubber insulated cables.

OKOLITE—for oil-base rubber insulated cables.

OKOPRENE—neoprene blend for jacketing.

OKOWELD—for insulating and sheathing in one application up to 2000 volts.

MANSON—super-strong friction tape.

The Okonite Company, Subsidiary of Kennecott Copper Corporation, Passaic, N. J.

OKONITE splicing materials
80 years of cable craftsmanship

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FEDERAL SAVINGS ASSOCIATION

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SUNDSTROM DAVIS

CILCo Boosts Sundstrom, Names Davis as Successor

Central Illinois Light Co has promoted Oscar L. Sundstrom to assistant operating vice president.

A. Herbert Davis succeeded Sundstrom as general superintendent of electric production and transmission. William T. Reid Jr was named to replace Davis as chief engineer, E. D. Edwards Generating Station.

Clerkin Named President Of GT&E International

James J. Clerkin Jr has been elected president of General Telephone & Electronics International Inc, international manufacturing and marketing subsidiary of GT&E Corp.

Clerkin (photo), former executive vice president of Comptometer Corp, succeeded Gene K. Beare who was recently elected president of Sylvania Electric Products, Inc, a GT&E subsidiary.

Ellenberger Elected VP, International Operations

The new vice president-international operations at Worthington Corp is Fred R. Ellenberger, succeeding S. Riley Williams who retired from that post but will continue with the company as vice president and consultant.

ELLENBERGER

Fiene Promoted to Sales VP for Electric Autolite

Earl R. Fiene has been appointed vice president and director of sales for Electric Autolite Co.

He has most recently been directing sales of automotive original equipment sales for Electric Autolite.

Nickel Heads A-C Nuclear Power Unit–Washington

At Allis-Chalmers Manufacturing Co, Henry C. Nickel has become manager of the nuclear power department-Washington. He succeeds Harold Etherington, new general manager of the atomic energy division.

NICKEL

Wallrath Given Sales Post

Hans R. Wallrath has been named manager of construction industry sales for General Electric Co.

He will direct sales of GE products and systems to such market areas as building construction, heavy engineering construction, and water, sewage and defense construction projects, and will develop sales policies and procedures for GE in this market area.

PERSONAL BRIEFS

William A. Verrochi has been named to succeed **W. Herbert Lambert** as superintendent of production for Pennsylvania Electric Co. Lambert became assistant to the vice president-technical.

New York State Electric & Gas Corp has promoted **E. W. Vick** to assistant secretary and assistant to the president.

Potomac Electric Power Co has named **John R. O'Hanlon** secretary.

At Western Massachusetts Electric Co, **Edward T. Augustine** has been made assistant vice president; **Joseph L. Hyland,** production and electric operations superintendent; **Russell D. Purrington,** production superintendent; and **Norman W. Blanchard,** superintendent of West Springfield station.

General Electric Co has recently appointed **Robert C. Spencer Jr** supervisor of turbine steam design engineering in the large steam turbine-generator department, succeeding **Henry Hegetschweiler** who became manager of the department's export sales. In the electric utility engineering operation, **Charles A. Woodrow** became systems engineer for Southern and Atlantic areas (from Pennsylvania to Florida, the Southwest, Texas, and Oklahoma) and **Robert N. Slinger** was named systems engineer for Western areas (west of the Rockies).

OBITUARIES

Louis J. Benedetti, 68, founder of Industrial Electric Co and retired chairman of Northwest Electric Co . . . **James D. Dunlap,** 46, metals market manager for Minneapolis-Honeywell Regulator Co's industrial products group . . . **Jackson Porter Dick Sr,** 72, former vice president and director of Georgia Power Co . . . **Roy Aikin,** 68, retired head of Empire District Electric Co's purchasing department . . . **Howard A. Enos,** 70, retired head of American Electric Power Service Corp's distribution engineering department . . . **Penn Brooks Myrick,** 71, treasurer at Savannah Electric & Power Co . . . **Bernard C. Engsberg,** 76, head of the Lake Mills Water & Light Department . . . **Milton J. Mitts,** 58, safety supervisor of Public Service Electric & Gas Co . . . **Malcolm Thomson,** 69, retired designer and engineer at General Electric Co . . . **Lawrence M. Flagg,** 61, line department superintendent in Portland General Electric Co's Salem district . . . **Herbert T. Dyett,** 86, former president and chairman of Rome Cable Corp.

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Safety Is Chicago EEI Topic

Committees, experts report on promotion of 'bare-hand' line technique, portable defibrillator, 'stop-shock' drive

"Once you have seen it done, you can't get up fast enough to try the 'bare-hand' technique yourself, even on a 345-kv line," Harold L. Rorden, American Electric Power Service Corp, told the 71st meeting of the Accident Prevention Committee of Edison Electric Institute, April 23-27, at Chicago.

After experience and practice, the bare-hand technique (EW, Dec. 19, 1960, p 76) offers the lineman advantages and benefits, including enhancement of safety, which cannot be overlooked, Rorden said.

Linemen who mastered the technique say that they "won't have to climb anymore." Thus, it is easy to see, Rorden stated, how the technique can extend the gainful work-life of older linemen.

Defibrillator Shown

The AEP System prescribes attaching the workman electrically to the energized conductor to prevent charging current from flowing through his body, Rorden said. The "Faraday cage" now is used only for work on 345-kv lines. And there is no hazard to anyone touching the truck from the ground during work on energized lines, even at 345 kv, unless the lower boom of the aerial basket contacts an energized underbuilt line.

The real limitation of the bare-hand technique is not the voltage level, but accessibility of the basket to the work, Rorden pointed out.

A new prototype of a portable closed-chest defibrillator was shown to the committee by Dr W. B. Kouwenhoven and his associate, Guy Knickerbocker, both of Johns Hopkins Hospital. The 45-lb package, though not designed to be taken up a pole, has all parts integrated. Operating from a 115-v, 60-cps source, or from storage batteries (6 or 12-v), the two 25-μfd capacitors in the unit are charged in 6 to 8 sec. The capacitors are discharged through a special switch to produce, first, a positive, then a negative wave through the victim's heart. Discharge is controlled by the rescuer through pressing both electrodes onto the victim.

In applying the closed-chest cardiac massage, external pressure is applied to a victim whose heart has stopped, said Dr Kouwenhoven. He reported that Cleveland Electric Illuminating, Delaware P&L, California-Oregon Power, Pacific G&E, and Southern California Edison are training employees in the new technique.

Four Johns Hopkins' experts, he said, are visiting hospitals to give training, and the American Red Cross plans to extend such training to the public.

Dr Kouwenhoven requested that utilities report to him the circumstances and results of closed-chest massaging. He added that in two instances victims were kept alive through the method, used with resuscitation, for 23 min or longer before a hospital defibrillator took over. Both patients, he said, have resumed normal lives.

Guidance Needed

Crew leaders want help and guidance in carrying a stop-shock program to their crews. This is the experience of the Electric Council of New England with a program of conferences now in its third year, reported John W. Gronbeck. The real block to the stop-shock safety campaign has been at the intermediate levels of supervision, he said.

The Electric Council of New England arranged conferences for top line department superintendents, then extended them to assistant superintendents and general line foremen. This year, through regional meetings, 224 crew leaders have taken part in the conferences, higher supervisors in the line department acting as discussion leaders. The stop-shock program will continue until every crew leader, lineman and groundman in New England is reached, Gronbeck said.

The monthly safety package, concentrating on the "stop-shock" program, is directed specifically at the first line supervisor in practical "talk" language, said Herbert B. McMahan, Florida Power Corp. Ten of the 12 themes for the 1962 monthly safety series have been selected, including "Your First Shock Could be Your Last," "Let's Work Hand in Glove to Stop Shock," "Teaching New Tricks," and "Safety is No Magic Trick." Speaking for his subcommittee, McMahan urged making the package a part of 1962 safety planning.

"Anatomy of Electric Shock," a 12-min sound-slide film, now is available from the EEI, reported Gronbeck. This technical film, sponsored by the Accident Prevention Committee, presents a broad introduction to the subject and emphasizes the hazard of low-voltage electric shock. It costs $35 per copy.

Visual Aids Stressed

Gronbeck urged manufacturing companies who supply the industry to explore the use of sound-slide visual aids as a means of demonstrating new equipment and techniques to utility employees.

Michael J. Bendkovic, Public Service Co of Colorado, reported that the committee will have ready in a few months a sound-slide presentation on grounding techniques. He emphasized that greater use be made of visual aids on subjects of wide interest to the industry.

The industry has not recognized the limited effect of using portable protective grounds to safeguard employees working on de-energized lines, said H. Earl Hatfield, Georgia Power Co. Recent tests on the Georgia Power system proved that grounding of lines adds nothing beyond the application of a dead short or the draining off of electrostatic charges. He urged committee members to consider protective devices that put the lineman at the potential of the grounded line, thus protecting him when the line is inadvertently energized.

Utility safety people and management are not doing all they can to prevent motor vehicle accidents, said Eugene H. Wessels Jr, Western Massachusetts Electric Co. He noted that while the number of vehicles covered in his report was

(*Continued on page* 100)

GENERAL SALES MANAGER

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Safety Is Chicago EEI Topic (*Continued from page* 98)

less, the number of accidents in 1960 was 6% greater, with 13 fatalities, compared with 1959's 12 fatalities. He said that 52 of 59 companies reported the use of compact cars. While the "compacts" represent 11.5% of vehicles in his report, they were involved in only 2.1% of the accidents. Standard-size cars were involved in 14% of the accidents. Cost of repairing damage averaged $83 per compact and $170 for standard cars.

Seven utilities reported no instance of electric shock, burn, or flash injuries to employees during 1960, said Errol Dunbar, Potomac Electric Power Co. Of these seven, three have a "ground-to-ground" rule for rubber protective equipment.

Of the 193 reported cases of contact accidents, Dunbar said, more than 60% involved injured employees who did not wear protective equipment as required. His summary showed that eight lost-time contact accidents and 23 other accidents involved low-voltage circuits.

Between 1958 and 1960, fatal accidents involving head contacts decreased from 25 to 5%, most cases in 1960 involving contact under the safety hat on the back of the neck. Thus, with almost every company now requiring safety hats, head contact accidents have almost disappeared. If this complete observance is extended to gloves, sleeves, and other protective equipment, "the same 80% reduction" would be reflected in other exposures, Dunbar concluded.

The 105 fatalities in 1960 put cases above 100 for the first time since 1957, said William C. Bremner, Commonwealth Edison Co. Fatalities from electric shock and burn were 71.4% of the total. A review of other cases shows the need for encouraging safe driving habits among utility employees and for greater care in working above ground, Bremner commented.

Temperature Differential Controls BFP Recirculation (*Continued from page* 57)

less than a year of operation in a relatively cool location. A thorough investigation showed that the transmitter and electro-pneumatic converter were not mounted properly to prevent vibration from affecting tube life. When the mountings were modified, this problem was eliminated.

The temperature-rise system of protection has worked very satisfactorily since May, 1960. The pumps have been fully protected through an emergency unscheduled full-load and several light-load trips.

The temperature rise for operation of the recirculating valves has been reached very infrequently. Were the normal method of flow control protection in use, there would have been much more frequent operation of the valves. Control by temperature rise has definitely reduced the number of valve operations thus reducing pumping power requirements and maintenance of flow control valves and breakdown orifices.

The system can be modified easily and adapted for control of a modulating-type recirculation control valve.

Prompted by the proved performance of temperature control of boiler feed pump recirculation protection, VEPCO is proceeding with the installation of similar control on two units to be placed in service in the spring of 1962. One control will be on a full-size, turbine-driven, high-speed boiler feed pump for the Possum Point Unit 4, is rated at 200 Mw nameplate. The second will be on a similar unit for the Portsmouth No. 4 extension.

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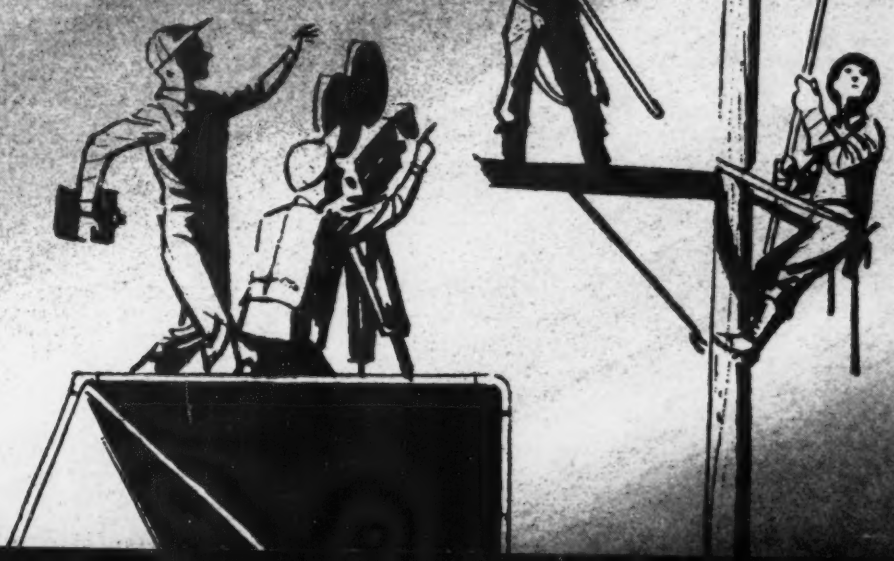

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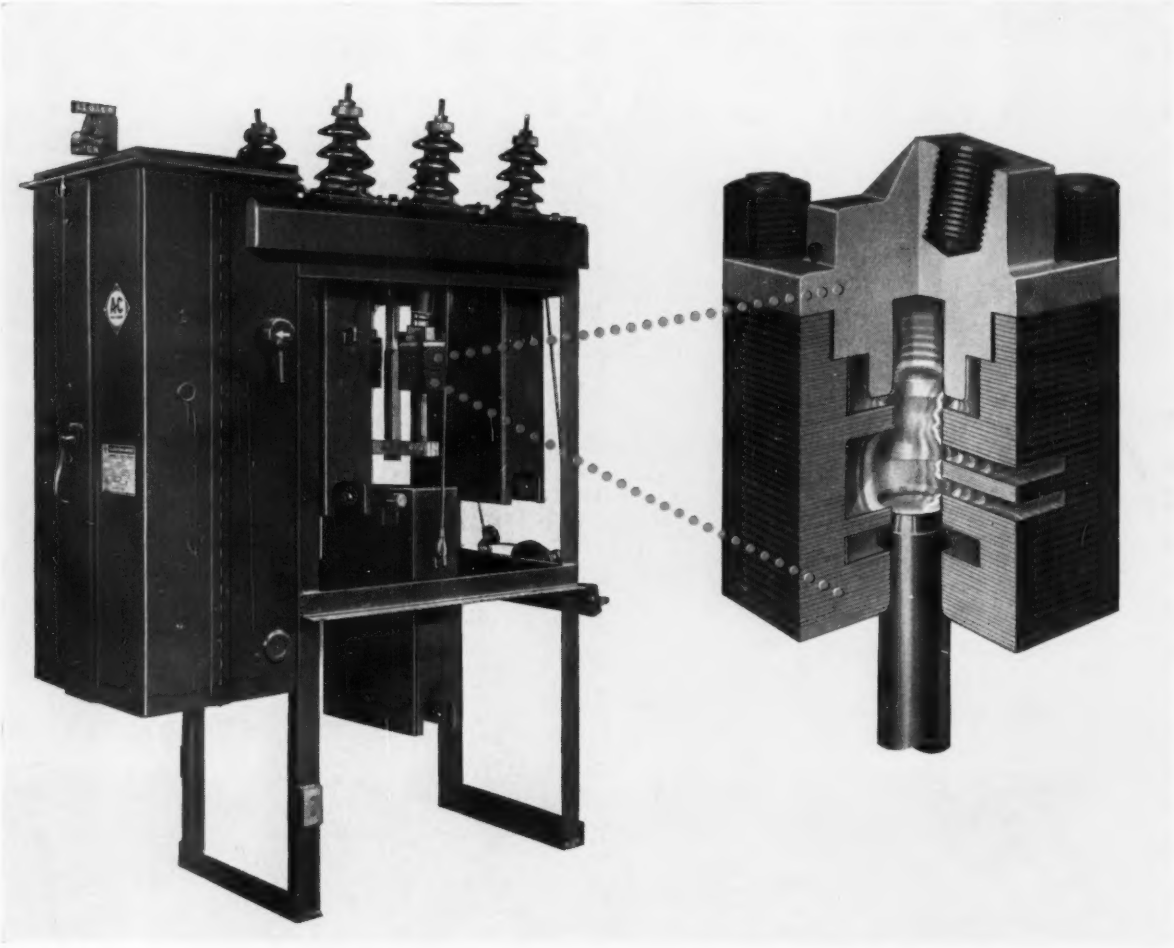

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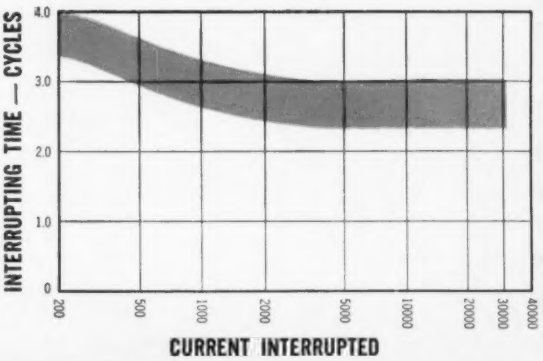

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